PB89-126726

Precision and Accuracy Assessments for State and Local Air Monitoring Networks 1981-1986

(U.S.) Environmental Monitoring Systems Lab.
Research Triangle Park, NC

Aug 88

U.S. Department of Commerce
National Technical Information Service
NTIS

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/600/4-88/037	**2.**	**3. RECIPIENT'S ACCESSION NO.** PB89 126726/AS
4. TITLE AND SUBTITLE PRECISION AND ACCURACY ASSESSMENTS FOR STATE AND LOCAL AIR MONITORING NETWORKS, 1981-1986, SUPPLEMENT TO EPA /600/4-88/ 007		**5. REPORT DATE** August 1988 **6. PERFORMING ORGANIZATION CODE**
7. AUTHOR(S) Raymond C. Rhodes		**8. PERFORMING ORGANIZATION REPORT NO.**
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Environmental Protection Agency Office of Research and Development Environmental Monitoring Systems Laboratory Research Triangle Park, NC 27711		**10. PROGRAM ELEMENT NO.** **11. CONTRACT/GRANT NO.**
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency Office of Research and Development Environmental Monitoring Systems Laboratory Research Triangle Park, NC 27711		**13. TYPE OF REPORT AND PERIOD COVERED** **14. SPONSORING AGENCY CODE** EPA/600/08

15. SUPPLEMENTARY NOTES

16. ABSTRACT

Precision and accuracy assessments of air quality data obtained from State and local air monitoring agencies during the six years, 1981-1986, are summarized in graphical form for each reporting organization. For most reporting organizations, the graphs show an improvement in data quality during the six-year period. Comparisons across reporting organizations for the same pollutant measurements reveal persistent significant differences.

The data quality assessments are also summarized and shown graphically for each EPA Region and for the Nation. Persistent significant differences are evident among the Regions. Investigation to identify the causes of these persistent significant differences and implementation of appropriate corrective actions are recommended to further improve data quality. The importance of the originating agencies plotting of quality control charts for the individual site results is emphasized. Examples of the charts included in Florida's quarterly quality assurance report are presented and discussed.

This report covers the period from 1981 through 1986, and work was completed as of July 1988. This report is a supplement to EPA-600/4-88-007.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group

18. DISTRIBUTION STATEMENT Unrestricted	**19. SECURITY CLASS** *(This Report)* Unclassified	**21. NO. OF PAGES** 372
	20. SECURITY CLASS *(This page)* Unclassified	**22. PRICE**

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

EPA/600/4-88/037
August 1988

PB89-126726

PRECISION AND ACCURACY ASSESSMENTS FOR STATE AND LOCAL AIR MONITORING NETWORKS 1981-1986

Supplement to EPA/600/4-88/007

by

Raymond C. Rhodes
Quality Assurance Division
Environmental Monitoring Systems Laboratory
Research Triangle Park, North Carolina 27711

U.S. ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
ENVIRONMENTAL MONITORING SYSTEMS LABORATORY
RESEARCH TRIANGLE PARK, NORTH CAROLINA 27711

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

NOTICE

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

ABSTRACT

Precision and accuracy assessments of air quality data obtained from State and local air monitoring agencies during the six years, 1981-1986, are summarized in graphical form for each reporting organization. For most reporting organizations, the graphs show an improvement in data quality during the six-year period. Comparisons across reporting organizations for the same pollutant measurements reveal persistent significant differences.

The data quality assessments are also summarized and shown graphically for each EPA Region and for the Nation. Persistent significant differences are evident among the Regions. Investigation to identify the causes of these persistent significant differences and implementation of appropriate corrective actions are recommended to further improve data quality. The importance of the originating agencies plotting of quality control charts for the individual site results is emphasized. Examples of the charts included in Florida's quarterly quality assurance report are presented and discussed.

This report covers the period from 1981 through 1986, and work was completed as of July 1988. This report is a supplement to EPA-600/4-88-007.

CONTENTS

Page

Abstract iii

Figures vi

Acknowledgments vii

1. Introduction 1

2. Results by Reporting Organization 2

Order of Presentation 5

Observations from the Graphical Presentations 9

3. Results by Region and for the Nation 13

4. Control Charts for Precision and Accuracy Data 14

5. Conclusions and Recommendations 25

References 26

Appendices

G. Precision and Accuracy Graphs for Each Reporting Organization G-0

H. Precision and Accuracy Graphs for Each EPA Region H-0

I. Precision and Accuracy Graphs for the Nation I-0

FIGURES

Number Page

1 Example graphs for a reporting organization, continuous method results 3

2 Example graphs for a reporting organization, manual method results 4

3 Example of negative bias reported for SO_2 continuous method 10

4 Example of improvement in precision and accuracy over time 10

5 Examples of consistently wide and narrow probability limits . . . 11

6 Example of graphs showing results that vary considerably in a similar pattern from year to year 11

7 Example graphs showing decreasing limits with increasing accuracy level 12

8 Example graphs for years when no data were reported 12

9 Example of Florida's quarterly report, probability limits for precision and accuracy of the TSP and CO methods 16

10 Example of Florida's quarterly report, probability limits for precision and accuracy of the O_3 and SO_2 continuous methods 17

11 Precision data for two TSP sites 19

12 Precision data for one TSP site during two quarters of 1987 . . . 20

13 Accuracy data for flow rate at seven TSP sites 21

14 Precision data for O_3 at two sites during two quarters of 1987 22

15 Continuous SO_2 precision data for two sites showing a shift to a negative bias 23

16 Continuous SO_2 precision data indicating bias that should be corrected 24

ACKNOWLEDGMENTS

The author expresses particular appreciation to Mr. Les Sizemore of Northrop Services, Inc. for his excellent efforts in computer programming to obtain the graphical outputs for the precision and accuracy data in this report. Appreciation is also due to Mr. Frank McElroy (EMSL) for his usual thorough technical review, Ms. Jan Parsons (Northrop Services, Inc.) for her very thorough editorial review, and to Ms. Elizabeth Hunike (EMSL) for her accurate and expeditious typing.

A special thanks is given to Mr. Don Stuart and Mr. Dick Arbes of the Quality Assurance Section, Bureau of Air Quality Management, State of Florida for permission to use some of the precision and accuracy graphs presented in their Quarterly Quality Assurance Report.

SECTION 1

INTRODUCTION

Federal regulations promulgated on May 10, 1979 (40 CFR Part 58)[1] require the State and local air monitoring agencies to perform special checks to assess the accuracy and precision of their ambient air measurement systems for the criteria pollutants. The special checks have been required since January 1, 1981, and a summarized form of the results is reported to the EPA, Environmental Monitoring Systems Laboratory (EMSL), Research Triangle Park (RTP), North Carolina for further summarization and evaluation.

Details concerning the performance of the special checks, and the reporting of the results have been presented in annual reports for the years 1981 through 1986.[2-7] The annual results for each reporting organization were tabulated in the reports, and graphical presentations were made to show time trends from year-to-year for the EPA Regions and the Nation.

The purpose of this report is to present graphs of the results for each reporting organization for the six-year period, 1981-1986, so that time trends and other relationships can be shown.

Revised regulations of March 19, 1986 (40 CFR Part 58)[1] require that the special checks for accuracy and precision be continued and that all of the raw data rather than summarized results be reported to EMSL/RTP for all special checks made after December 31, 1986. Because the more detailed reporting of data for 1987 and beyond will enable a more detailed summarization, analysis, and evaluation to be made, it was deemed appropriate to provide this six-year graphical summary for each reporting organization to the States and EPA Regional Offices. Sections 2 and 3 contain discussions of these summaries and explanations of how they are presented.

Also included in this report is some discussion of the need for the originating agencies to maintain quality control charts for each site. Examples of charts that the State of Florida includes in their quarterly quality assurance report are presented and discussed in Section 4.

SECTION 2

RESULTS BY REPORTING ORGANIZATION

Air monitoring data quality assessments, as 95 percent probability limits, are shown graphically for each reporting organization by year, 1981-1986, in Appendix G.*

Figures 1 and 2 illustrate the form and arrangement of the graphs for each reporting organization. The example, Kentucky, Jefferson County Air Pollution Control District, was selected because it shows the reporting for all possible measurement methods. The first page shows the graphs for Continuous Methods, while the second shows the graphs for Manual Methods. The Continuous Methods are presented in the following order, from top to bottom: CO, SO_2, NO_2, and O_3. The Manual Methods are presented in the following order, from top to bottom: Total Suspended Particulates (TSP), SO_2, NO_2, and Pb.

Precision is always shown as the left-most graph followed by Accuracy, Levels 1, 2, and 3 from left to right. All 3 levels for accuracy are shown for all methods except for TSP, where only a single level (reported as level 2) was required, and for Pb where only two levels (reported as levels 1 and 2) were required. The results of level 4 for episode continuous monitors are not shown in this report because a large number of reporting organizations do not have episode monitors. It should be noted that the scales for all corresponding graphs are the same throughout to enable visual comparisons to be made from reporting organization to reporting organization.

The upper and lower extremes of the vertical bars shown for each year represent the upper and lower 95 percent probability limits, respectively, for all of the precision and accuracy checks made during the year in the reporting organization. It is expected that 5 percent of the results of the individual precision or accuracy checks would exceed these limits. The midpoints of the vertical bars are connected to better show trends and biases. In all cases, the vertical scales on each chart are the percent deviation of an observed precision and accuracy result from a test or reference value.

For more detail concerning the actual precision and accuracy checks and the computations of the 95 percent probability limits, the reader is referred to any of the documents listed as references for this report.

---

*Originally, the graphs in this report were planned to be included in the 1986 report, which contains Appendices A-F. However, because of the large number of pages, this separate report was prepared. Thus, the first appendix in this report is Appendix G.

95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 18   KENTUCKY
REPORG: 002 KY, JEFFERSON CO. AIR POLL. CONTROL DIST

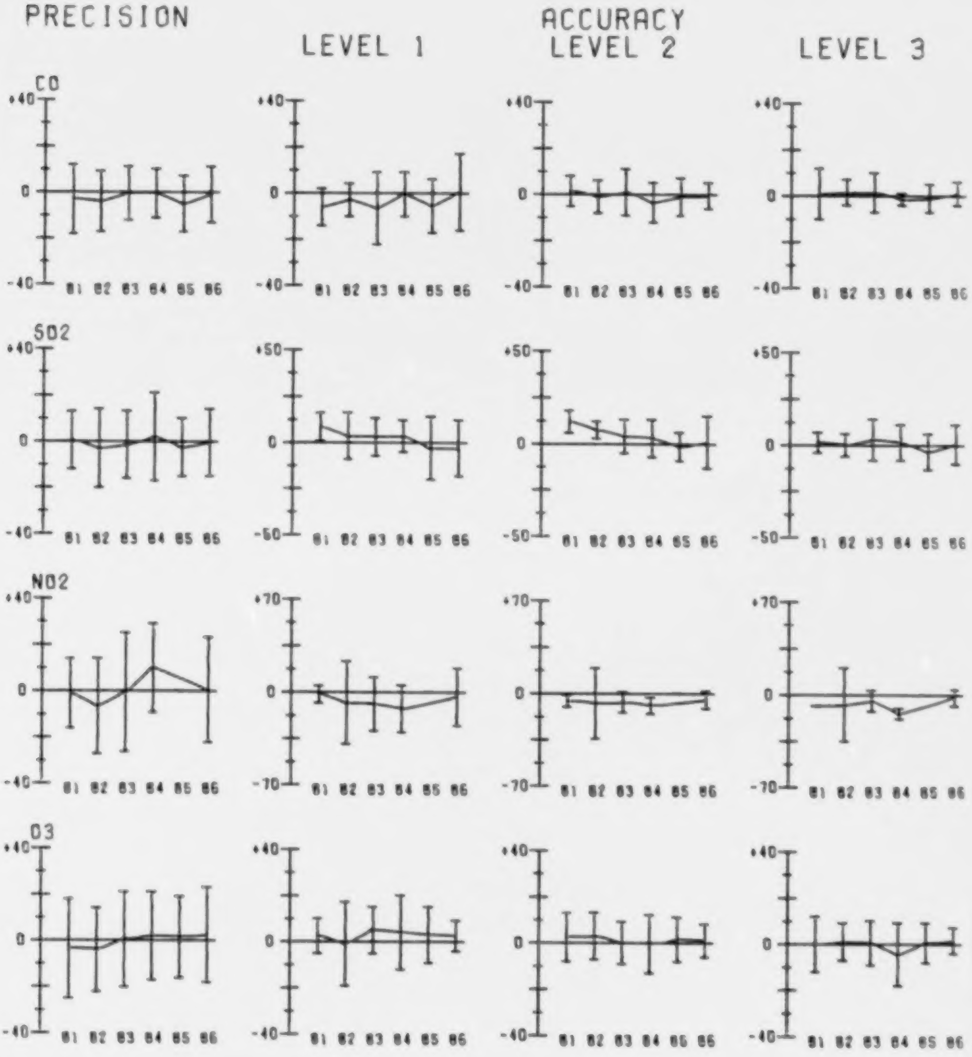


Figure 1. Example graphs for a reporting organization, continuous method results.

95% PROBABILITY LIMITS 81-86
MANUAL METHODS
REG : 04
STATE : 18 KENTUCKY
REPORG: 002 KY. JEFFERSON CO. AIR POLL. CONTROL DIST

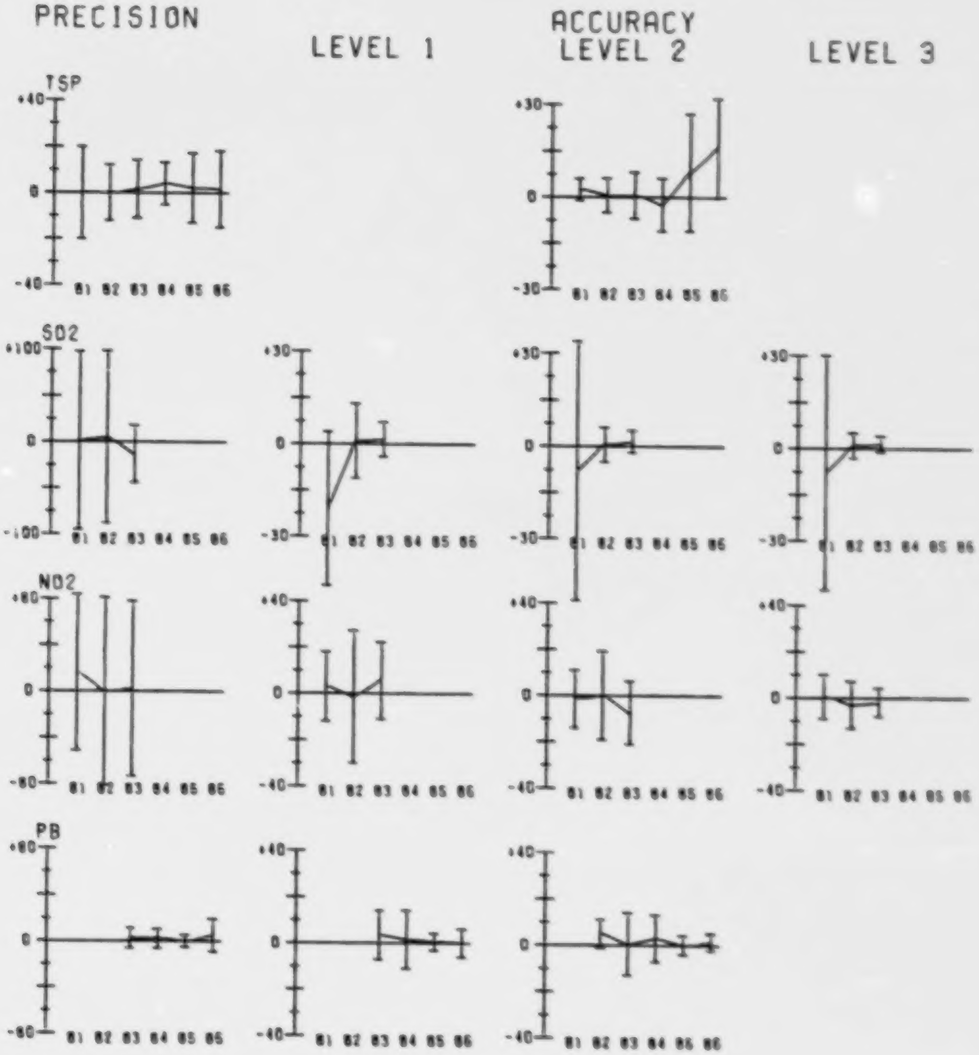


Figure 2. Example graphs for a reporting organization, manual method results.

As can be seen in Figures 1 and 2, the scale ranges (%) are as follows:

	Precision	Accuracy All Levels
Continuous Methods		
CO	-40 to +40	-40 to +40
SO_2	-40 to +40	-50 to +50
NO_2	-40 to +40	-70 to +70
O_3	-40 to +40	-40 to +40
Manual Methods		
TSP	-40 to +40	-30 to +30
SO_2	-100 to +100	-30 to +30
NO_2	-80 to +80	-20 to +40
Pb	-80 to +80	-40 to +40

Figures 1 and 2 also show that although the graphs for the continuous SO_2 and NO_2 and the manual SO_2 and NO_2 are located in the same positions on the page for comparison purposes, the scales are different. Whenever a reporting organization has not reported for a given method for any year, that portion of the page is left blank. Always shown at the top of each page is the EPA Region number, the state number and name, and the reporting organization number and name.

ORDER OF PRESENTATION

To avoid the need to provide a detailed table of contents for each state or reporting organization, the graphs in Appendix G are presented in the following order:

1. By Region, in numerical order;
2. Within Region by State, in alphabetical and numerical order;
3. Within State by Reporting Organization, in numerical order.

Thus, the graphs appear in the order shown below.

	State		Reporting Organization	
Region	No.	Name	No.	Name
01	07	CONNECTICUT	001	AIR MONIT. SEC. DEPT. OF ENV. PROTECT.
01	20	MAINE	001	BUREAU OF A.Q.C. DEPT. OF ENV. PROTECT.
01	20	MAINE	101	S.D. WARREN CO., WESTBROOK
01	20	MAINE	102	S.D. WARREN CO., HINCKLEY
01	20	MAINE	103	INTERNATIONAL PAPER CO., JAY
01	20	MAINE	104	BOISE CASCADE CO., RUMFORD
01	20	MAINE	106	DRAGON PRODUCTS, THOMASTON
01	20	MAINE	107	SCOTT PAPER CO., WINSLOW

	State		Reporting Organization	
Region	No.	Name	No.	Name
01	20	MAINE	108	CHAMPION INTERNATIONAL CORP., BUCKSPORT
01	20	MAINE	109	LINCOLN PULP AND PAPER CO., LINCOLN
01	20	MAINE	110	GREAT NORTHERN PAPER CO., MILLINOCKE
01	20	MAINE	112	GEORGIA PACIFIC CO., WOODLAND
01	22	MASSACHUSETTS	001	DIV. OF AQC. DEPT. OF ENV. QUAL. ENG.
01	30	NEW HAMPSHIRE	001	AIR RESOURCES AGENCY
01	41	RHODE ISLAND	001	DIV. OF A. HAZ. MAT. DEPT. OF ENV. MANAGE.
01	47	VERMONT	001	AIR & SOLID WASTE PROGRAMS
02	31	NEW JERSEY	001	DEPT. OF ENV. PROT., DIV. OF ENV. QUAL.
02	33	NEW YORK	001	DEPT. OF ENV. CONSERV., DIV. OF AIR
02	40	PUERTO RICO	001	ENVIRONMENTAL QUALITY BOARD
02	55	VIRGIN ISLANDS	001	DEPT. OF CONS. AND CULTURAL AFFAIRS
02	55	VIRGIN ISLANDS	017	MARTIN MARIETTA
03	08	DELAWARE	001	STATE OF DELAWARE, DNR & EC
03	09	DISTRICT OF COLUMBIA	001	WASHINGTON, DC DC & RA
03	21	MARYLAND	001	STATE OF MARYLAND
03	21	MARYLAND	002	ALLEGANY COUNTY
03	21	MARYLAND	003	ANNE ARUNDEL COUNTY
03	21	MARYLAND	004	BALTIMORE CITY
03	21	MARYLAND	005	BALTIMORE COUNTY
03	21	MARYLAND	006	PRINCE GEORGE'S COUNTY
03	39	PENNSYLVANIA	001	PENNSYLVANIA DER
03	39	PENNSYLVANIA	002	ALLEGHENY CO. BAPC
03	39	PENNSYLVANIA	003	PHILADELPHIA AMS
03	48	VIRGINIA	001	VIRGINIA STATE AIR POLL. CONTROL BOARD
03	48	VIRGINIA	002	CITY OF ALEXANDRIA
03	48	VIRGINIA	003	FAIRFAX COUNTY
03	48	VIRGINIA	004	ROANOKE COUNTY
03	48	VIRGINIA	005	TENNESSEE VALLEY AUTHORITY - VA
03	48	VIRGINIA	006	TENNESSEE VALLLEY AUTHORITY - VA
03	50	WEST VIRGINIA	001	STATE OF WEST VIRGINIA
03	50	WEST VIRGINIA	002	WVA NORTHERN PANHANDLE REGIONAL OFFICE
04	01	ALABAMA	011	ALABAMA DEPT. OF ENVIRONMENTAL MGT.
04	01	ALABAMA	012	AL, JEFFERSON CNTY. BUREAU OF ENV. HLTH.
04	01	ALABAMA	013	AL DEPT. OF ENV. MANAGEMENT - MOBILE
04	01	ALABAMA	014	AL, HUNTSVILLE AIR POLL. CONTROL DEPT.
04	01	ALABAMA	015	AL, TRICOUNTY DIV. OF AIR POLL. CONTROL
04	01	ALABAMA	016	TENNESSEE VALLEY AUTHORITY - ALABAMA
04	10	FLORIDA	001	FDER, NORTHWEST DISTRICT
04	10	FLORIDA	002	FDER, NORTHEAST DISTRICT
04	10	FLORIDA	003	FDER, ST. JOHNS RIVER DISTRICT
04	10	FLORIDA	004	FDER, SOUTHWEST DISTRICT
04	10	FLORIDA	005	FDER, SOUTH FLORIDA DISTRICT
04	10	FLORIDA	006	FDER, SOUTHEAST FLORIDA DISTRICT
04	10	FLORIDA	007	FDER, NORTHEAST DISTRICT BRANCH OFFICE
04	10	FLORIDA	011	FL, JACKSONVILLE BIO-ENV. SERVICES DIV.
04	10	FLORIDA	012	FL, HILLSBOROUGH CO., ENV. SERVICES DIV.

	State		Reporting Organization	
Region	No.	Name	No.	Name
04	10	FLORIDA	013	FL, PINELLAS CO. DEPT. OF ENV. MANAGEMENT
04	10	FLORIDA	014	FL, MANATEE COUNTY HEALTH DEPARTMENT
04	10	FLORIDA	015	FL, SARASOTA CO. AIR POLL. CONTROL DIV.
04	10	FLORIDA	016	FL, PALM BEACH COUNTY HEALTH DEPARTMENT
04	10	FLORIDA	017	FL, BROWARD CO. ENV. QUAL. CONTROL BOARD
04	10	FLORIDA	018	FL, DADE CO. DEPT OF ENV. RESOURCES MGT.
04	10	FLORIDA	020	FL, ORANGE CO. ENV. PROTECTION DEPT.
04	10	FLORIDA	022	EVERGLADES NATIONAL PARK
04	11	GEORGIA	010	GEORGIA AIR QUAL. EVALUATION SECTION EPD
04	18	KENTUCKY	001	KENTUCKY DIV. OF AIR POLL. CONTROL
04	18	KENTUCKY	002	KY, JEFFERSON CO. AIR POLL. CONTROL DIST.
04	18	KENTUCKY	003	TENNESSEE VALLEY AUTHORITY - KENTUCKY
04	25	MISSISSIPPI	100	MISSISSIPPI BUREAU OF POLLUTION CONTROL
04	34	NORTH CAROLINA	001	NC NATURAL RESOURCES & COMMUNITY DEVEL.
04	34	NORTH CAROLINA	002	NC, FORSYTH COUNTY ENV. AFFAIRS DEPT.
04	34	NORTH CAROLINA	003	NC, MECKLENBURG CO. DEPT. OF ENV. HEALTH
04	34	NORTH CAROLINA	004	NC, WESTERN REGIONAL AIR POLL. CONTROL
04	42	SOUTH CAROLINA	001	SC DEPT. OF HEALTH & ENV. CONTROL
04	44	TENNESSEE	001	TENNESSEE DIV. OF AIR POLL. CONTROL
04	44	TENNESSEE	002	TN, MEMPHIS-SHELBY CO. HEALTH DEPARTMENT
04	44	TENNESSEE	003	METRO HEALTH DEPT. NASHVILLE-DAVIDSON CO.
04	44	TENNESSEE	004	TN, KNOX COUNTY DEPT. OF AIR POLL. CONTROL
04	44	TENNESSEE	005	TN, CHATTANOGGA-HAMILTON CO. AIR POLL. CONT.
04	44	TENNESSEE	006	TENNESSEE VALLEY AUTHORITY - TENNESSEE
05	14	ILLINOIS	001	DIV. OF AIR POLL. CONT., ILLINOIS EPA
05	14	ILLINOIS	002	CHICAGO DEPT. OF CONSUMER SERVICES
05	14	ILLINOIS	003	COOK COUNTY DEPT. OF ENVIRONMENTAL CONT.
05	15	INDIANA	001	AIR POLL. CONT. DIV. OF INDIANA STATE
05	15	INDIANA	002	DIV. OF AIR POLL. CONT., EVANSVILLE
05	15	INDIANA	003	ST. JOSEPH COUNTY
05	15	INDIANA	004	DIV. OF AIR POLLUTION CONTROL, GARY
05	15	INDIANA	005	AIR POLL. CONT. DIV., VIGO COUNTY
05	15	INDIANA	006	DIV. OF AIR QUALITY, EAST CHICAGO
05	15	INDIANA	007	AIR POLLUTION CONTROL DIV., HAMMOND
05	15	INDIANA	008	INDIANAPOLIS APC DIVISION
05	15	INDIANA	009	ANDERSON LOCAL AGENCY
05	15	INDIANA	010	PORTER COUNTY HEALTH DEPARTMENT
05	15	INDIANA	100	LAKE COUNTY CONSOLDTD. AQ MONIT. WRK. GRP.
05	15	INDIANA	101	PUBLIC SERVICE OF INDIANA
05	23	MICHIGAN	001	AIR QUAL. DIV., MI DEPT. OF NAT. RES.
05	23	MICHIGAN	002	AIR POLL. CONT. DIV., WAYNE COUNTY
05	24	MINNESOTA	001	MINNESOTA POLL. CONT. AGENCY, AIR MO
05	36	OHIO	001	OHIO EPA, CENTRAL DISTRICT OFFICE
05	36	OHIO	002	OHIO EPA, NORTHEAST DISTRICT OFFICE
05	36	OHIO	003	OHIO EPA, NORTHWEST DISTRICT OFFICE
05	36	OHIO	004	OHIO EPA, SOUTHEAST DISTRICT OFFICE
05	36	OHIO	005	OHIO EPA, SOUTHWEST DISTRICT OFFICE
05	36	OHIO	006	AKRON AIR POLLUTION CONTROL

	State		Reporting Organization	
Region	No.	Name	No.	Name
05	36	OHIO	007	AIR POLL. CONT. DIV., CANTON CITY
05	36	OHIO	008	SOUTHWESTERN OHIO AIR POLL. AGENCY
05	36	OHIO	009	CLEVELAND DIV. OF AIR POLL. AGENCY
05	36	OHIO	010	REGIONAL APC AGENCY, DAYTON
05	36	OHIO	012	AIR POLL. CONT. DIV. OF LAKE COUNTY
05	36	OHIO	013	AIR POLL. UNIT, PORTSMOUTH CITY
05	36	OHIO	014	NORTH OHIO VALLEY AIR AUTHORITY
05	36	OHIO	015	TOLEDO POLL. CONTROL AGENCY
05	36	OHIO	016	MAHONING TRUMBULL AIR POLL. CONTROL
05	51	WISCONSIN	001	WI. DEPT. OF NAT. RES., AIR MONIT. UNIT
06	04	ARKANSAS	001	DEPT. OF POLL. CONT. & ECOLOGY CONT. MON
06	04	ARKANSAS	002	DEPT. OF POLL. CONT. & ECOLOGY
06	19	LOUISIANA	001	DEPT. OF NATURAL RESOURCES, NEW ORLEANS
06	19	LOUISIANA	002	KEMRON ENV. SERVICES, BATON ROUGE
06	32	NEW MEXICO	001	ENV. IMPROVEMENT DIV., SANTA FE
06	32	NEW MEXICO	002	CITY OF ALBUQUERQUE ENV. HEALTH DIV.
06	37	OKLAHOMA	101	OK STATE DEPT. OF HEALTH
06	37	OKLAHOMA	102	OKLAHOMA CITY-CNTY. HEALTH DEPT.
06	37	OKLAHOMA	103	TULSA CITY-CNTY. HEALTH DEPT.
06	45	TEXAS	001	TEXAS AIR CONTROL BOARD
06	45	TEXAS	002	DALLAS ENV. HEALTH & CONSERVATION DEPT.
06	45	TEXAS	003	EL PASO CITY-CNTY. HEALTH DEPT.
06	45	TEXAS	004	FT. WORTH PUBLIC HEALTH DEPT.
06	45	TEXAS	005	GALVESTON COUNTY HEALTH DISTRICT
06	45	TEXAS	006	HOUSTON DEPT. OF PUBLIC HEALTH
06	45	TEXAS	007	SAN ANTONIO METRO. HEALTH DISTRICT
07	16	IOWA	001	POLK COUNTY PHYSICAL PLANNING
07	16	IOWA	002	LINN COUNTY HEALTH DEPARTMENT
07	16	IOWA	003	UNIVERSITY HYGIENIC LABORATORY
07	17	KANSAS	001	STATE OF KANSAS
07	26	MISSOURI	001	LABORATORY SERVICES PROGRAM
07	26	MISSOURI	002	ST. LOUIS COUNTY
07	26	MISSOURI	003	ST. LOUIS CITY
07	26	MISSOURI	004	KANSAS CITY
07	26	MISSOURI	005	SPRINGFIELD
07	26	MISSOURI	006	AMAX LEAD CO. OF MO, BOSS, MO
07	26	MISSOURI	007	ST. JOE LEAD CO., HERCULANEUM, MO
07	28	NEBRASKA	001	STATE OF NEBRASKA
07	28	NEBRASKA	002	LINCOLN
07	28	NEBRASKA	003	OMAHA
08	06	COLORADO	001	DEPARTMENT OF HEALTH
08	27	MONTANA	001	MT AIR QUAL. BUREAU, DEPT. OF H&ENV.
08	27	MONTANA	002	YELLOWSTONE CNTY. AIR POLL. CONT. AGY.
08	27	MONTANA	003	GREAT FALLS CITY-CNTY. HEALTH DEPT.
08	27	MONTANA	004	MISSOULA CITY-CNTY HEALTH DEPT.
08	35	NORTH DAKOTA	001	STATE DEPARTMENT OF HEALTH
08	43	SOUTH DAKOTA	001	DEPT. OF HEALTH, DIV. OF ENV. HEALTH
08	46	UTAH	001	STATE BUREAU OF AIR QUALITY

Region	State		Reporting Organization	
	No.	Name	No.	Name
08	52	WYOMING	001	DEPT. OF ENV. QUAL., AIR QUAL. DIV.
09	03	ARIZONA	100	ARIZONA DEPT. OF HEALTH SERVICES
09	03	ARIZONA	200	MARICOPA COUNTY
09	03	ARIZONA	300	PIMA COUNTY
09	05	CALIFORNIA	001	CALIFORNIA AIR RESOURCES BOARD
09	05	CALIFORNIA	004	BAY AREA AIR QUAL. MANAGEMENT DISTRICT
09	05	CALIFORNIA	036	SAN DIEGO AIR POLL. CONTROL DISTRICT
09	05	CALIFORNIA	061	SOUTH COAST AIR QUAL. MANAGEMENT DIST.
09	12	HAWAII	120	STATE OF HAWAII, DEPT. OF HEALTH
09	29	NEVADA	100	NEVADA DIV. OF ENV. PROTECTION
09	29	NEVADA	200	WASHOE COUNTY
09	29	NEVADA	300	CLARK COUNTY
09	54	GUAM	100	GUAM EPA
10	02	ALASKA	020	DEPT. OF ENVIRONMENTAL CONSERVATION
10	13	IDAHO	001	DEPARTMENT OF HEALTH AND WELFARE
10	13	IDAHO	002	ENGINEERING SCI., INC. (CONTRACTOR)
10	38	OREGON	001	DEPT. OF ENVIRONMENTAL QUALITY
10	49	WASHINGTON	001	DEPT. OF ECOLOGY

OBSERVATIONS FROM THE GRAPHICAL PRESENTATIONS

A number of trends or effects can be readily perceived by a visual review of the graphs. Examples of some of these trends or effects are given below. The discussions of the various examples given in the figures are not intended to be complete. A critical review of particular graphs may reveal other significant patterns.

Negative or Positive Bias. A slight negative bias for the continuous SO_2 method has been noted from the Regional graphs of all of the annual reports, 1981-1986 (see Figure 3). Possible explanations for these negative biases, given in the annual reports, have been the negative instrument drift of the analyzers or degradation of the precision/accuracy check materials. An example of these negative biases for reporting organizations is given below. The negative bias for precision and accuracy is about 10 percent. A few reporting organizations show a positive bias.

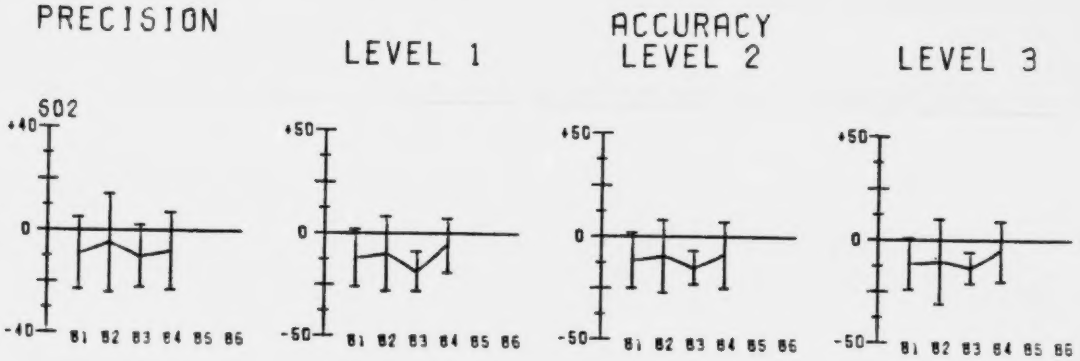


Figure 3. Example of negative bias reported for SO_2 continuous method.

Time Trends. For many of the reporting organizations, improvement is very evident as shown by decreasing widths of the probability limits (Figure 4). However, some reporting organizations show either no improvement or a negative improvement (worsening).

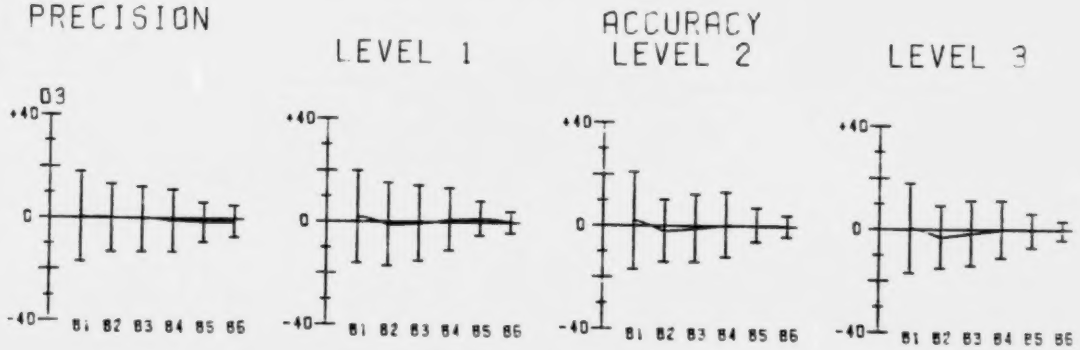


Figure 4. Example of improvement in precision and accuracy over time.

Wide Limits, Narrow Limits. Some reporting organizations have considerably wider probability limits than others, indicating much poorer precision or accuracy. Such reporting organizations should perform a thorough review of their measurement systems to determine the causes of the excessive variability and to take appropriate corrective actions to improve their results. Something may also be gained from discussions with those reporting organizations which seem to do much better than most. The graphs for Figure 5 show consistently wide or narrow limits.

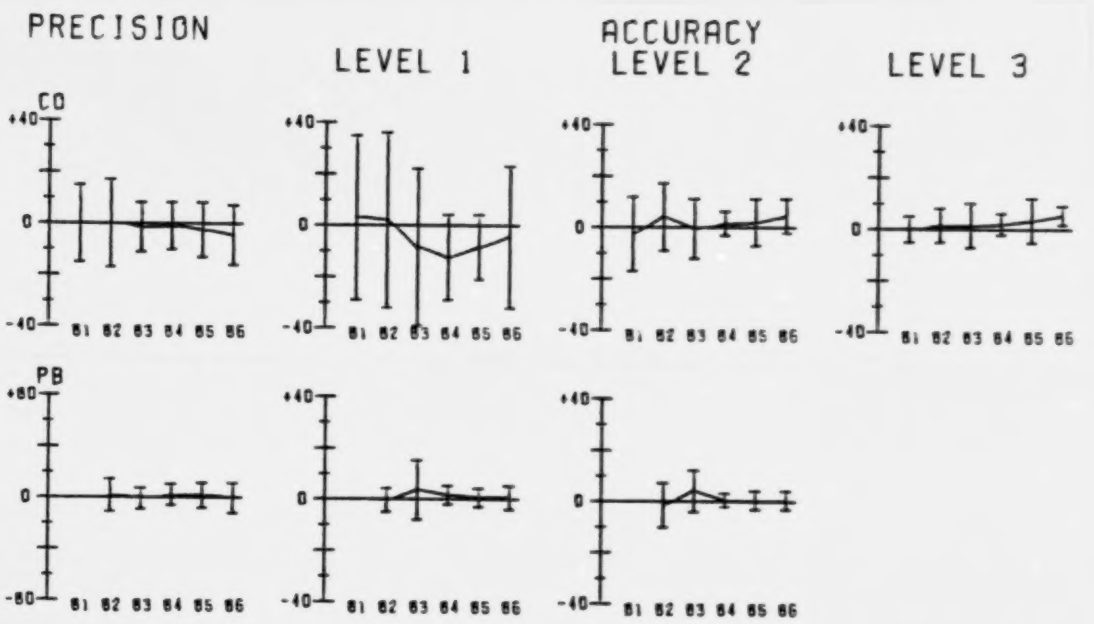


Figure 5. Examples of consistently wide and narrow probability limits.

Similar Patterns of Variability. Normally, if biases occur at one level of accuracy, they also occur at the other levels as well. These conditions would exist where all of the limits are too wide, too narrow, show the same trend over time, etc. Several examples of such patterns are shown in Figure 6. In other cases, however, the patterns from level to level may not be uniform or smooth, but may vary considerably in a similar pattern from year to year.

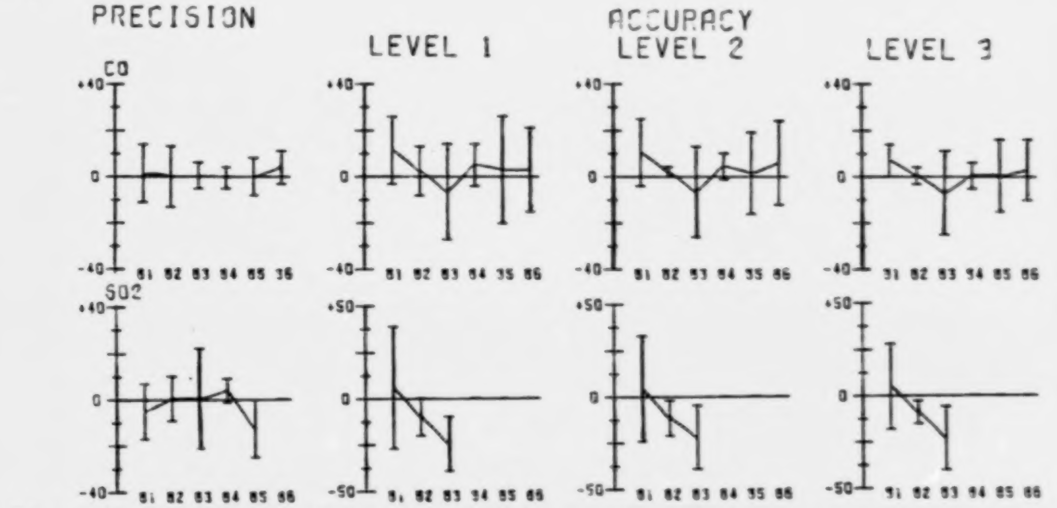


Figure 6. Examples of graphs showing results that vary considerably in a similar pattern from year to year.

Trends Across Accuracy Levels. The probability limits, which are in terms of percentages, are generally wider for level 1 than level 2 and wider for level 2 than level 3. In other words, the length of the vertical bars decreases with increasing level. This is the usual relationship for most measurement methods.

The decreasing limits with increasing level is particularly evident in Figure 7.

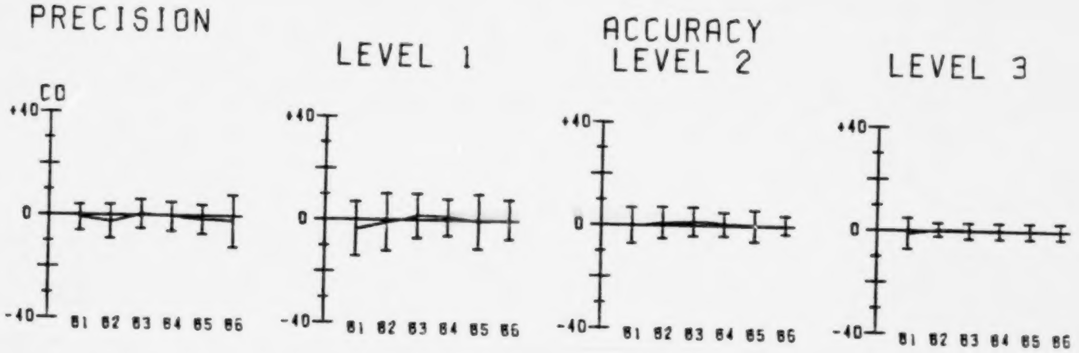


Figure 7. Example graphs showing decreasing limits with increasing accuracy levels.

In many of the other charts, the above relationship may not be evident visually, but would be shown from the actual numerical values. This relationship is more evident from the regional and national charts (Appendices H and I, respectively) which result from a much larger amount of data.

Zero Limits. Some of the charts show the upper and lower probability limits as zeros (Figure 8). Such instances represent years when no data were reported.

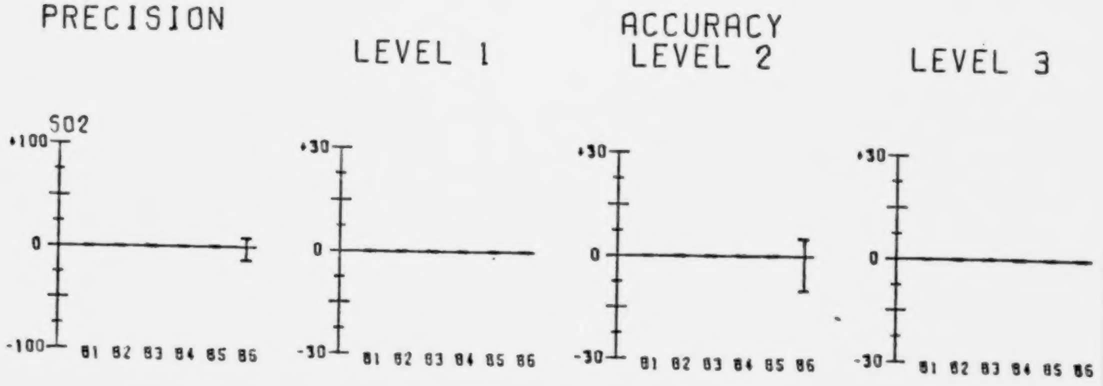


Figure 8. Example graphs for years when no data were reported.

SECTION 3

RESULTS BY REGION AND FOR THE NATION

The results for the EPA Regions are shown in Appendix H (graph sets H-1 through H-20) and for the Nation in Appendix I (graph sets I-1 and I-2).

The results are presented in the same form, arrangement, and scales as described in the preceding section.

The 95 percent probability limits for the EPA Regions and the Nation were calculated according to the same formulas as were used for the annual reports.[5-7] See Appendix B, "Formulas for Combining Probability Limits," of the annual reports for 1984, 1985, or 1986.

Although Regional comparisons and trends are discussed in considerable detail in the annual reports, a visual review of the charts in Appendix H reveals the following observations.

1. Region I charts do not show much improvement over the six-year period, except perhaps for O_3 precision. However, the widths of their probability intervals are generally smaller than for most other regions.

2. Region III charts for NO_2 (continuous) and O_3 show improvement over the six-year period.

3. Region IV charts show negative bias for continuous SO_2 and NO_2 and manual SO_2. Considerable improvements in precision for both manual SO_2 and NO_2 are evident for Region IV.

4. Region VI charts for precision of the manual SO_2 method and for accuracy of the manual NO_2 method show little variability.

5. Region IX charts for accuracy for the manual SO_2 method also show little variability.

6. All the Regional and National charts show the reduced variability with increasing level for accuracy.

7. The National chart for manual SO_2 accuracy shows the negative bias very similar to Region IV.

8. Except for 1986 manual NO_2, the precision data for the manual methods for the Nation shows improvement during the six-year period.

SECTION 4

CONTROL CHARTS FOR PRECISION AND ACCURACY DATA

The precision and accuracy assessments required by 40 CFR Part 58, Appendix A,[1] have several purposes. One use of the data is to provide the users of the ambient air monitoring data in the Aerometric Information Retrieval System (AIRS), formerly the National Air Data Bank (NADB) estimates of the quality of the data. These estimates are provided to the users of monitoring data whenever they request data from the NADB. Printouts of the precision and accuracy assessments for the corresponding geographical region (reporting organization) and time period (calendar quarter) are provided, along with the monitoring data. For monitoring data collected during the years 1981-1986, the precision and accuracy assessments reported are provided on a reporting-organization basis. However, beginning with 1987 data, the precision and accuracy assessments are obtained and can be provided on an individual-site basis.

Another use of the precision and accuracy data is to provide additional quality control information to the originating State and local air monitoring agencies. In addition to the normal routine quality control checks and procedures, these internal-but-independent precision and accuracy checks provide useful supplementary information for local quality control. Instructions on how statistical control charts can be prepared, maintained, and used are given in the "Guideline on the Meaning and Use of Precision and Accuracy Data Required by 40 CFR Part 58, Appendices A and B," EPA-600/4-83-023, June 1983.[8] These instructions were given on pages 38-39 of the guideline and were summarized in Table G on page 41. Reference in that document is also made to Appendix H of the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles," EPA 600/9-76-005[9] for further details.

An important advantage to the state and local agencies of using the precision and accuracy data is that control charts can be maintained on an individual site basis for most of the checks. The only exception is for the accuracy audits of the analytical portion of the manual methods, when the data only exists on a laboratory bias.

Timely plotting and use of the precision and accuracy data can detect out-of-control conditions (excessive variation or significant biases), which should be investigated and for which corrective measures should be taken to maintain closer control of the measurement systems, thereby providing more accurate and precise monitoring data.

Some states have been using the precision and accuracy data by plotting the individual results in chart form, similar to control charts but without statistical control limits. Other states may even compute and maintain their statistical control limits. However, EMSL/RTP does not receive copies of reports of the state and local agencies and does not observe the operations of these agencies; thus, the extent to which the local agencies actually use the precision and accuracy data as an adjunct to their routine quality control is not known. EMSL/RTP does routinely receive, by request, a copy of Florida's quarterly quality assurance report titled "The Confidence Limits of Measurements."[10] In this report, they present in graphical form the individual precision and accuracy results for some of the individual sites.

Some of the pages of the Florida quarterly report are presented in Figures 9-16 to illustrate some of the visual indications or conclusions that can be gained, even though the charts contain no statistical control limits. The charts would be even more useful if they included statistical control limits based on past performance under controlled conditions.

Figure 9 shows the quarterly probability limits for precision and accuracy for the TSP and CO methods for each quarter from the first quarter of 1981 through the second quarter of 1987. The limits shown are the combined limits of all the reporting oganizations in the State of Florida. Note for TSP that the precision limits are always wider than the accuracy limits. This relationship results because the precision data obtained from collocated samplers involve most all of the sources of variability of the measurement process, whereas the accuracy audit reflects only the errors of the flow measurement portion of the measurement process. In contrast, the accuracy limits for CO are wider than the precision limits for practically all quarters since the third quarter of 1982. Prior to that time, the precision limits were wider than the accuracy limits for some reason. Over the entire six and one-half years, the precision limits have improved, whereas the accuracy limits have not.

Figure 10 shows similar graphical plots of the precision and accuracy data for the O_3 and SO_2 continuous methods. Some general trends and relationships are evident from these charts. For O_3, a general improvement in both precision and accuracy is evident. On the SO_2 chart, the negative bias of both precision and accuracy is evident because the midpoints of the bars are below zero in most cases. And, accuracy limits are wider in most cases than precision limits, for both O_3 and SO_2 as expected because the accuracy results include both bias and precision.

All four of the charts in Figures 9 and 10 include the following Goals for Precision and Accuracy Limits:

	Precision	Accuracy
TSP	± 15%	± 15%
CO	± 15%	± 20%
O_3	± 15%	± 20%
SO_2	± 15%	± 20%

Reproduced from
best available copy.

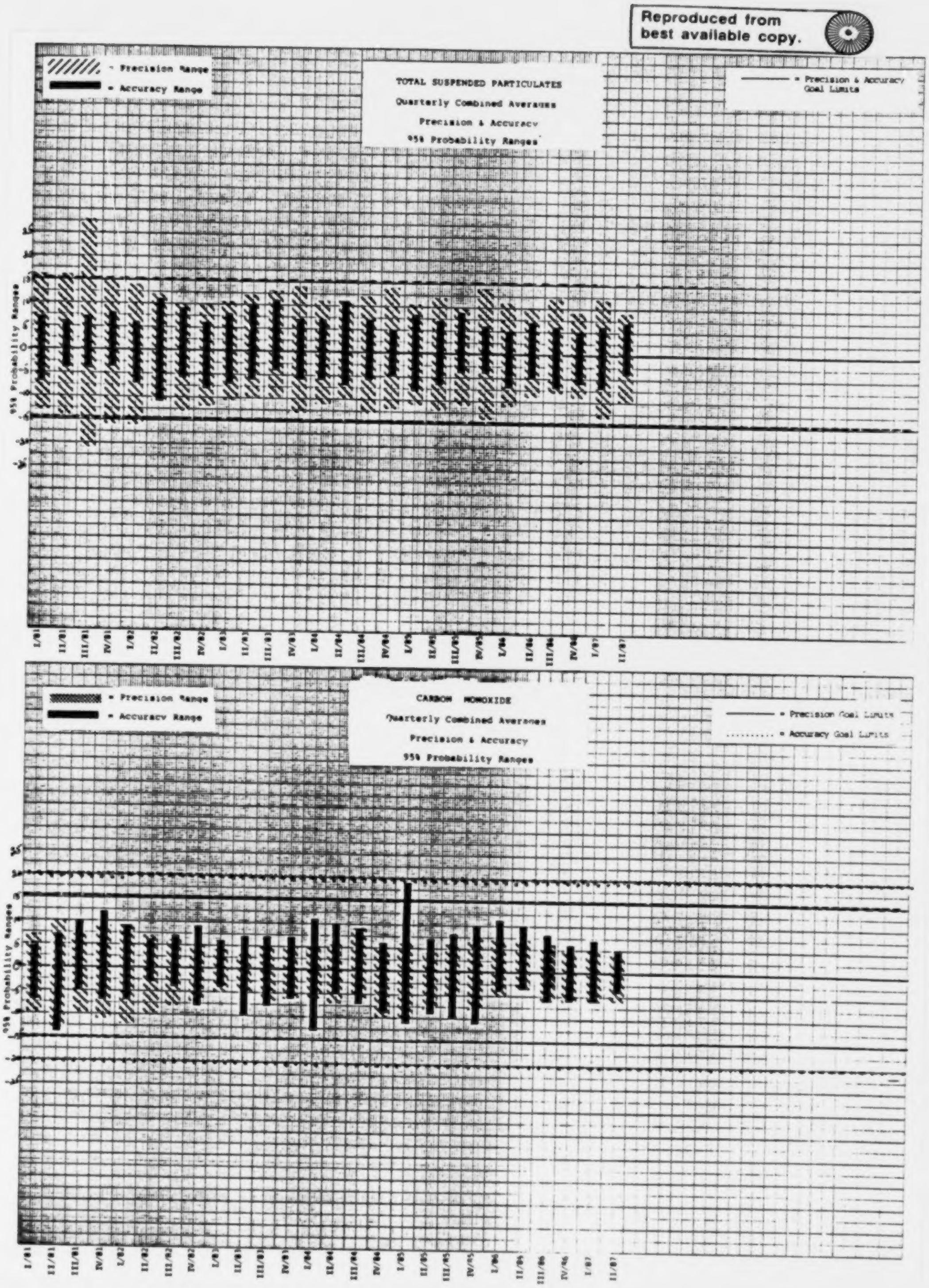


Figure 9. Example of Florida's quarterly report, probability limits for precision and accuracy of the TSP and CO methods.

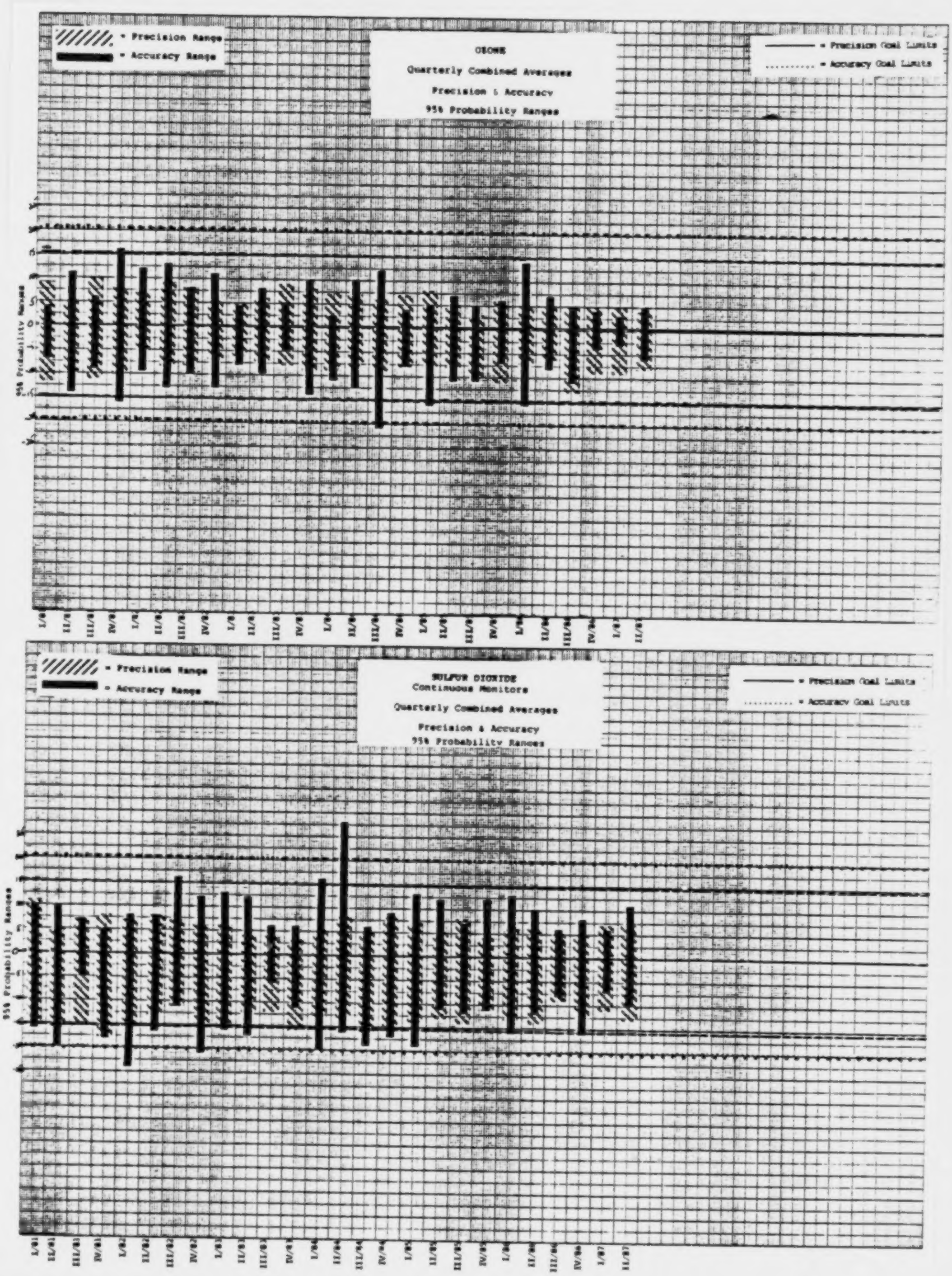


Figure 10. Example of Florida's quarterly report, probability limits for precision and accuracy of the O_3 and SO_2 continuous methods.

These are the somewhat arbitrary limits given in Section 2.0.11 of the "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods," EPA 600/4-77-027a.[11]

Figure 11 shows the individual precision check results for two TSP sites, 1200-005-F02 and 1200-009-F02, for 1987. On both charts a negative bias is clearly indicated. This bias results because the duplicate samplers gave lower values than the designated samplers at both sites. Such biases should be investigated and corrected, if possible. The charts further show that the results of site 1200-005-F02 are considerably more variable than those for site 1200-009-F02.

Figure 12 shows a decided shift in the precision data for TSP from the first quarter to the second quarter of 1987 for site 2860-003-F02. The 95% probability limits for the two quarters do not overlap, indicating some drastic shift in level.

Figure 13 shows the results of the accuracy audits for flow rate at seven TSP sites in the Florida Northeast District. The raw data results are shown at the top of the page, and a chart plot of all the TSP accuracy data is shown at the bottom. In most cases, the 95% probability interval includes zero, the desired result.

Figure 14 shows O_3 precision data for two sites for the first and second quarters of 1987. A decided improvement can be seen in the second quarter data over the first quarter data for the bottom chart. It would be good to have a note on the chart to explain why the improvement occurred.

Figure 15 shows continuous SO_2 precision data for two sites. On the bottom chart, the decided shift or trend to a negative bias indicates that some corrective action is needed.

Figure 16 also shows the precision data for continuous SO_2 at two sites. Because most of the data for site 1200-005-F02 and all of the data for site 1200-009-F02 are below zero, negative biases are indicated that should be investigated and corrected.

The State of Florida has agreed to send sample copies of their report to any agency that desires a copy. Such requests should be addressed to:

Mr. Don Stuart
Administrator
Quality Assurance Section
Bureau of Air Quality Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

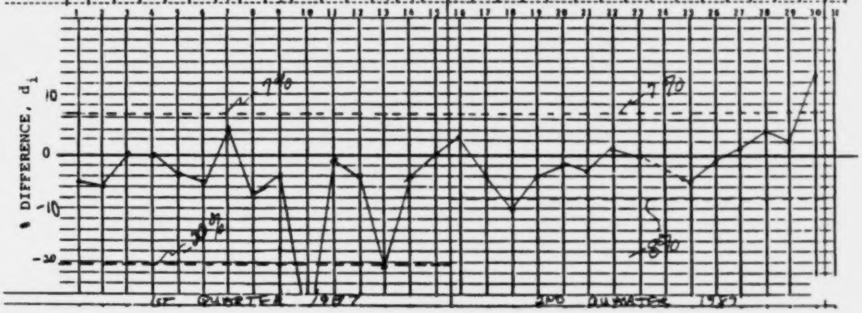
AGENCY NORTHEAST DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987

PROJECT Precision SAROAD SITE # 1200-005-F02 PARAMETER TSP METHOD CODE 91

MEASUREMENT UNITS ug/m^3 METHOD TYPE Hi Vol

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DATE 1	1/3	1/9	1/15	1/21	1/27	2/2	2/8	2/14	2/20	2/26	3/4	3/10	3/16	3/22	3/28
DATE 2															
Official	42	58	56	27	48	55	25	58	52	87	69	49	74	57	32
Duplica	40	55	56	27	46	52	26	54	50	61	68	47	60	55	32
3															
4															
5															
DIFF	-2	-3	0	0	-2	-3	1	-4	-2	-26	-1	-2	-14	-2	0
AVERAGE, $\bar{X}$	41	56.5	56	27	47	53.5	25.5	56	51	74	68.5	48	67	56	32
% DIFF, d_i	-5	-6	0	0	-4	-5	4	-7	-4	-35	-1	-4	-21	-4	0

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DATE 1	4/3	4/9	4/15	4/21	4/27	5/3	5/9	5/15	5/21	5/27	6/2	6/8	6/14	6/20	6/26	
DATE 2																
Official	69	71	53	78	58	62	74	53	56	41	69	73	43	50	45	
Duplica	71	68	48	75	57	60	75	53	--	43	68	74	45	51	51	
3																
4																
5																
DIFF	2	-3	-5	-3	-1	-2	1	0	--	2	-1	1	2	1	6	
AVERAGE, $\bar{X}$	70	69.5	50.5	76.5	57.5	61	74.5	53		42	68.5	73.5	44	50.5	48	
% DIFF, d_i	3	-4	-10	-4	-2	-3	1	0	--	-5	-1	1	4	2	13	



AGENCY NORTHEAST DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987

PROJECT Precision SAROAD SITE # 1200-009-F02 PARAMETER TSP METHOD CODE 91

MEASUREMENT UNITS ug/m^3 METHOD TYPE Hi Vol

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
DATE 1	1/3	1/9	1/15	1/21	1/27	2/2	2/8	2/14	2/20	2/26	3/4	3/10	3/16	3/22	3/28
DATE 2															
Official	36	38	44	22	49	57	94	56	37	42	43	36	62	46	35
Duplica	36	37	44	20	46	54	90	52	37	41	41	36	60	46	38
3															
4															
5															
DIFF	0	-1	0	-2	-3	-3	-4	-4	0	-1	-2	0	-2	0	3
AVERAGE, $\bar{X}$	36	37.5	44	21	47.5	55.5	92	54	37	41.5	42	36	61	46	36.5
% DIFF, d_i	0	-3	0	[illegible]	-6	-5	-4	-7	0	-2	-5	0	-3	0	8

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DATE 1	4/3	4/9	4/15	4/21	4/27	5/3	5/9	5/15	5/21	5/27	6/2	6/8	6/14	6/20	6/26	
DATE 2																
Official	41	83	115	79	37	43	54	29	34	23	40	40	48	39	53	
Duplica	44	81	116	77	35	42	54	28	33	22	37	39	46	36	53	
3																
4																
5																
DIFF	3	-2	1	-2	-2	-1	0	-1	-1	-1	-3	-1	-2	-3	0	
AVERAGE, $\bar{X}$	42.5	82	115.5	78	36	42.5	54	28.5	33.5	22.5	38.5	39.5	47	37.5	53	
% DIFF, d_i	7	-2	1	2	-6	-2	0	-4	-3	-4	-8	-2	-4	-8	0	

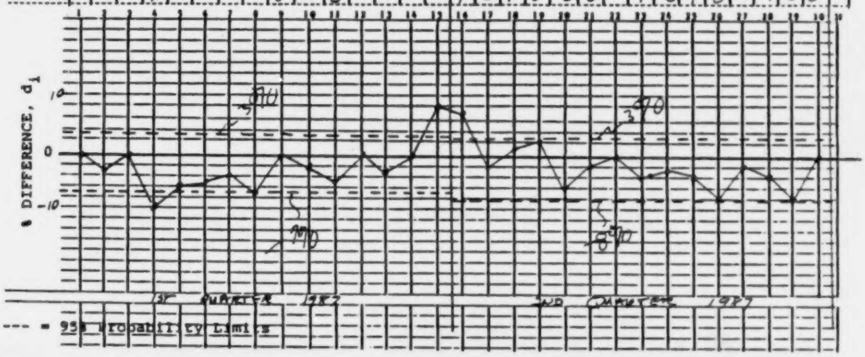
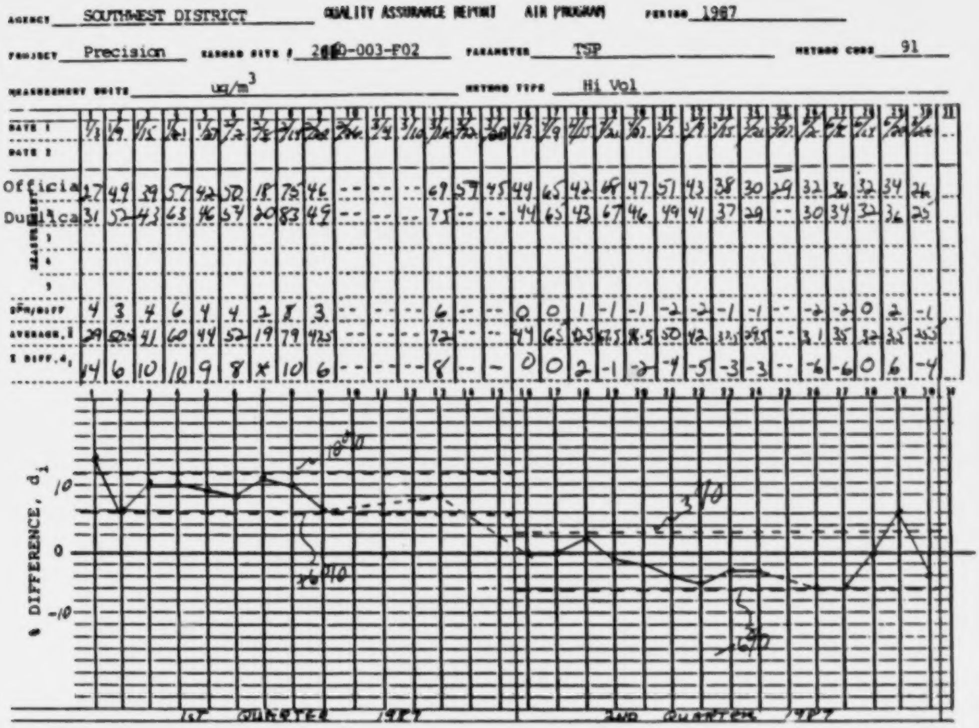


Figure 11. Precision data for two TSP sites.



AGENCY SOUTHWEST DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987

PROJECT Precision SAROAD SITE # 2[illegible]0-003-F02 PARAMETER TSP METHOD CODE 91

MEASUREMENT UNITS ug/m^3 METHOD TYPE Hi Vol

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
DATE 1	1/3	1/9	1/15	1/21	1/27	2/2	2/8	2/14	2/20	2/26	3/4	3/10	3/16	3/22	3/28	4/3	4/9	4/15	4/21	4/27	5/3	5/9	5/15	5/21	5/27	6/2	6/8	6/14	6/20	6/26	--
DATE 2																															
Official	27	49	39	57	42	50	18	75	46	--	--	--	69	57	45	44	65	42	68	47	51	43	38	30	29	32	36	32	34	26	--
Duplica	31	52	43	63	46	54	20	83	49	--	--	--	75	--	--	44	65	43	67	46	49	41	37	29	--	30	34	32	36	25	--
3																															
4																															
5																															
DIFF	4	3	4	6	4	4	2	8	3	--	--	--	6	--	--	0	0	1	-1	-1	-2	-2	-1	-1	--	-2	-2	0	2	-1	
AVERAGE, $\bar{X}$	29	50.5	41	60	44	52	19	79	47.5	--	--	--	72	--	--	44	65	42.5	67.5	46.5	50	42	37.5	29.5	--	31	35	32	35	25.5	
% DIFF, d_i	14	6	10	10	9	8	x	10	6	--	--	--	8	--	--	0	0	2	-1	-2	-4	-5	-3	-3	--	-6	-6	0	6	-4	

Figure 12. Precision data for one TSP site during two quarters of 1987.

AGENCY NORTHEAST DISTRICT PERIOD 1986-1987

PROJECT ACCURACY PARAMETER PARTICULATES METHOD CODE 91 MEASUREMENT UNITS m^3/min .METHOD TYPE HI VOL/FLOW RATE AUDIT

SAROAD# 1200-003-F02				SAROAD# 1200-005-F02				SAROAD# 1200-005-F09				SAROAD# 1200-008-F02				SAROAD# 1200-009-F02			
DATE	KNOWN	DIFF±	%DIFF±	DATE	KNOWN	DIFF±	%DIFF±	DATE	KNOWN	DIFF±	%DIFF±	DATE	KNOWN	DIFF±	%DIFF±	DATE	KNOWN	DIFF±	%DIFF±
3-7-86	0.98	.05	4.9	3/27/86	1.23 1.37 1.47	-.04 -.03 0	-3.3 -2.2 0					9/24/86	1.30	.03	2.3	4/1/86	1.23 1.37 1.50	-.007 -.010 .012	-5.7 -7.8 -8.6
11-20-86	1.45	.10	6.9	4/21/86	1.25	-.04	-3.2									6/23/86	1.16	-.05	-4.3
				1/22/87	1.26 1.39 1.52	-0.03 -0.05 -0.07	-2.3 -3.6 -4.6									3/2/87	1.24 1.37 1.50	.03 .01 0	2.4 0.7 0
				9/1/87	1.45	0.01	-0.7												

SAROAD# 1200-009-F09				SAROAD# 3780-001-F02				SAROAD# 3780-006-F02				SAROAD# 3900-004-F03			
DATE	KNOWN	DIFF±	%DIFF±	DATE	KNOWN	DIFF±	%DIFF±	DATE	KNOWN	DIFF±	%DIFF±	DATE	KNOWN	DIFF±	%DIFF±
				7/24/86	1.22 1.35 1.48	-.005 -.009 -.008	-4.1 -6.7 -5.4	8/4/86	1.55	-.07	-5.8	7/18/86	1.30	.04	3.1
				8/14/86	1.26	-.08	-6.4					9/15/86	1.14 1.48 1.60	.07 0 .04	6.1 0 2.5
												3/4/87	1.44	-0.05	-3.5

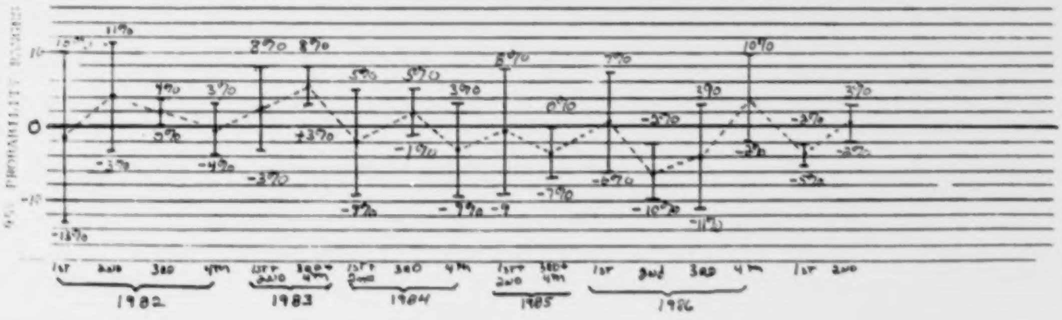
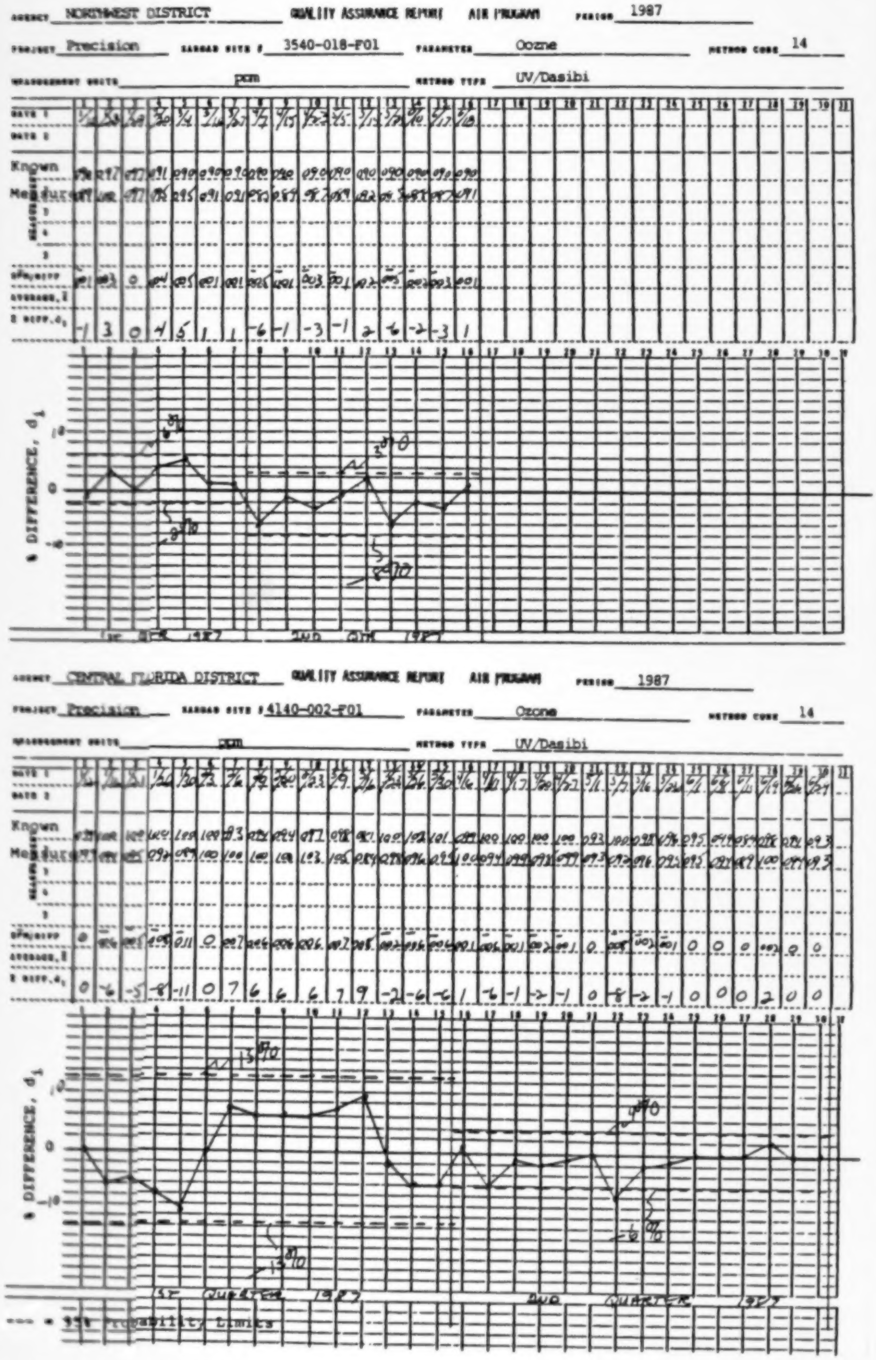


Figure 13. Accuracy data for flow rate at seven TSP sites.

Reproduced from best available copy.



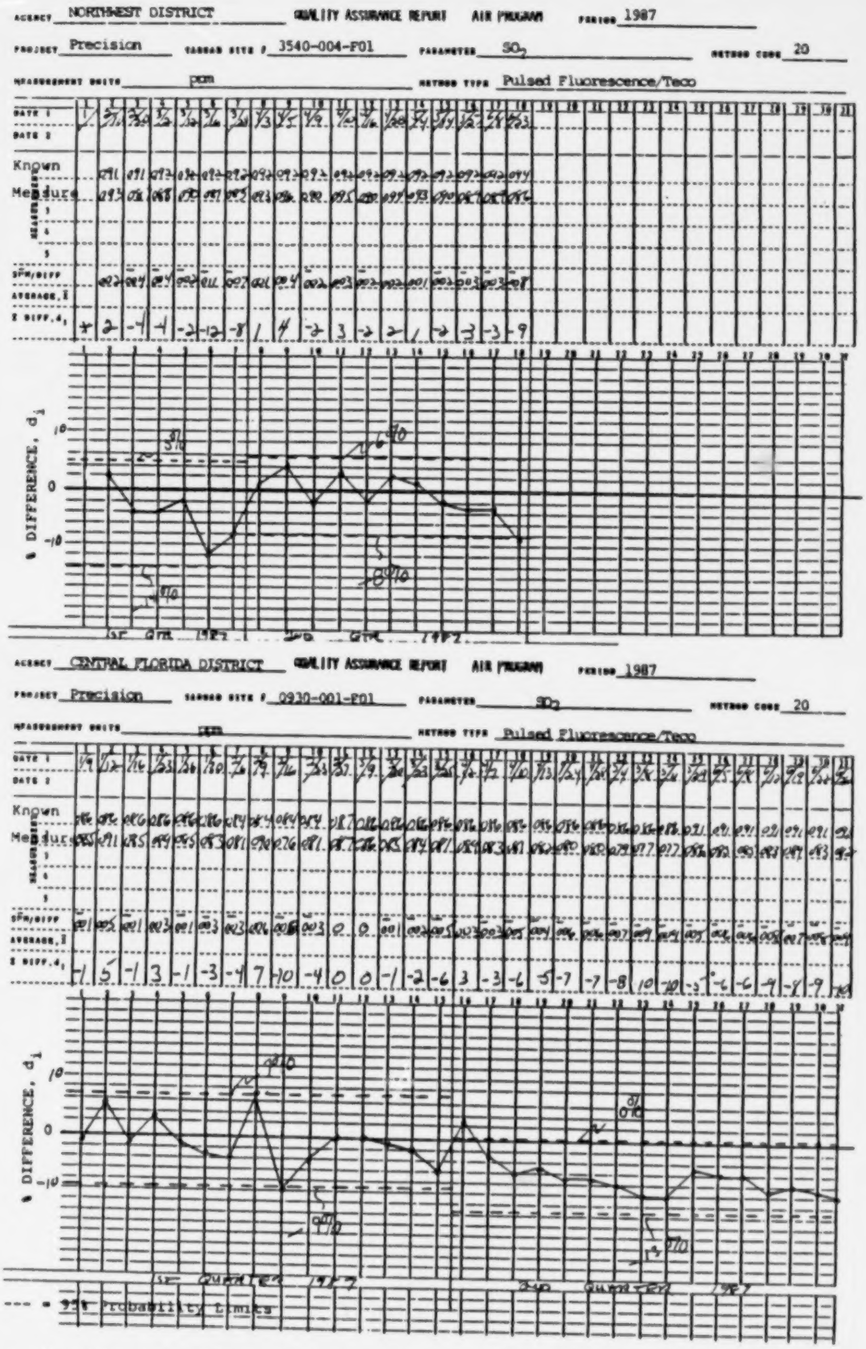
AGENCY NORTHWEST DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987
PROJECT Precision SAROAD SITE # 3540-018-F01 PARAMETER Oozne METHOD CODE 14
MEASUREMENT UNITS ppm METHOD TYPE UV/Dasibi

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
% DIFF., d_i	-1	3	0	4	5	1	1	-6	-1	-3	-1	2	-6	-2	-3	1

AGENCY CENTRAL FLORIDA DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987
PROJECT Precision SAROAD SITE # 4140-002-F01 PARAMETER Ozone METHOD CODE 14
MEASUREMENT UNITS ppm METHOD TYPE UV/Dasibi

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
% DIFF., d_i	0	-6	-5	-8	-11	0	7	6	6	6	7	9	-2	-6	-6	1	-6	-1	-2	-1	0	-8	-2	-1	0	0	0	2	0	0

Figure 14. Precision data for O_3 at two sites during two quarters of 1987.



AGENCY NORTHWEST DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987

PROJECT Precision SAROAD SITE # 3540-004-F01 PARAMETER SO_2 METHOD CODE 20

MEASUREMENT UNITS ppm METHOD TYPE Pulsed Fluorescence/Teco

% DIFF., d_i	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	+	2	-4	-4	-2	-12	-8	1	4	-2	3	-2	2	1	-2	-3	-3	-9

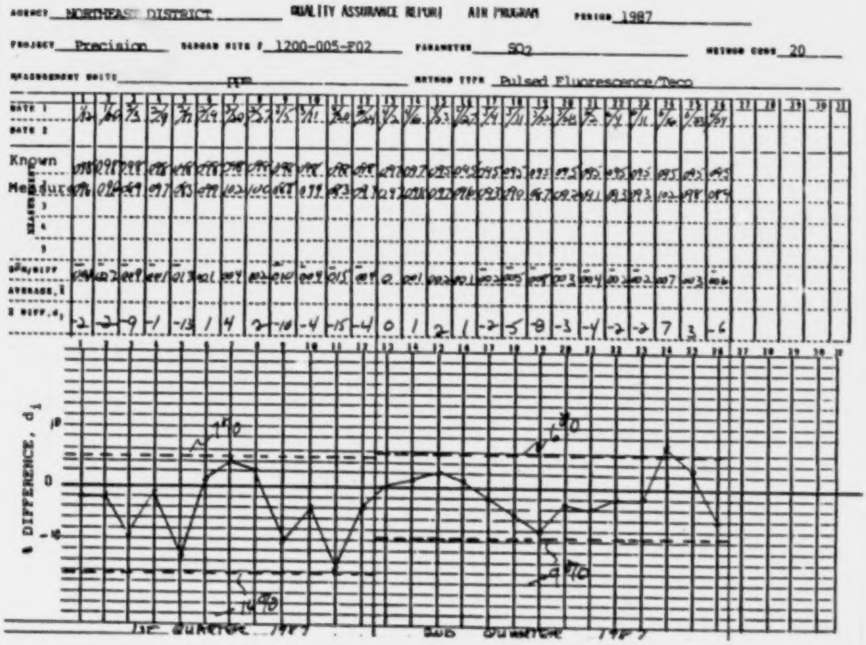
AGENCY CENTRAL FLORIDA DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987

PROJECT Precision SAROAD SITE # 0930-001-F01 PARAMETER SO_2 METHOD CODE 20

MEASUREMENT UNITS ppm METHOD TYPE Pulsed Fluorescence/Teco

% DIFF., d_i	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
	-1	5	-1	3	-1	-3	-4	7	-10	-4	0	0	-1	-2	-6	3	-3	-6	-5	-7	-7	-8	10	-10	-5	-6	-6	-9	-8	-9	-10

Figure 15. Continuous SO_2 precision data for two sites showing a shift to a negative bias.

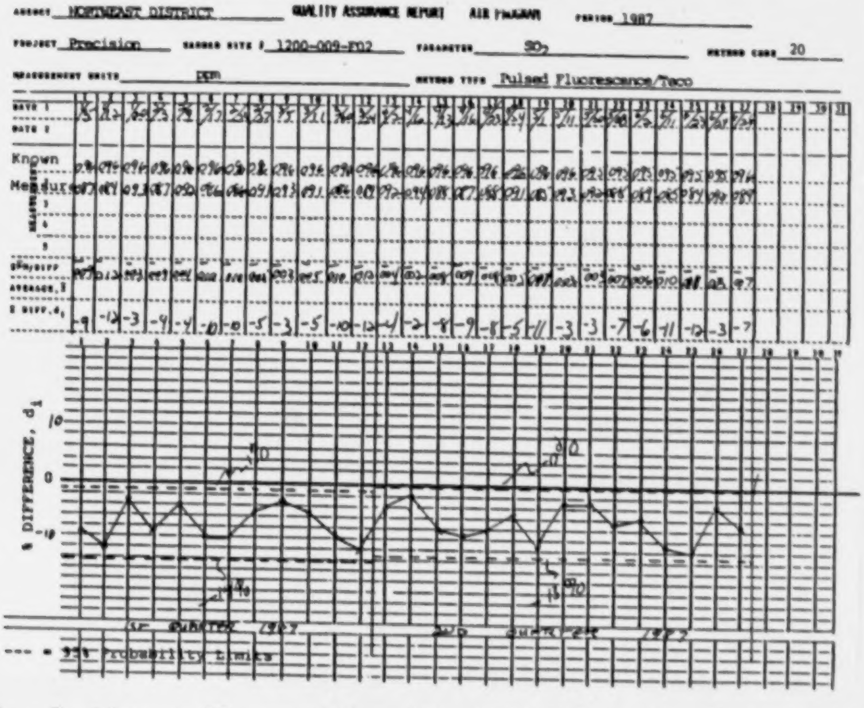


AGENCY NORTHEAST DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987

PROJECT Precision SAROAD SITE # 1200-005-F02 PARAMETER SO_2 METHOD CODE 20

MEASUREMENT UNITS ppm METHOD TYPE Pulsed Fluorescence/Teco

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
% DIFF, d_i	-2	-2	-9	-1	-13	1	4	2	-10	-4	-15	-4	0	1	2	1	-2	-5	-8	-3	-4	-2	-2	7	3	-6



AGENCY NORTHEAST DISTRICT QUALITY ASSURANCE REPORT AIR PROGRAM PERIOD 1987

PROJECT Precision SAROAD SITE # 1200-009-F02 PARAMETER SO_2 METHOD CODE 20

MEASUREMENT UNITS ppm METHOD TYPE Pulsed Fluorescence/Teco

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
% DIFF, d_i	-9	-12	-3	-9	-4	-10	-10	-5	-3	-5	-10	-12	-4	-2	-8	-9	-8	-5	-11	-3	-3	-7	-6	-11	-12	-3	-7

Figure 16. Continuous SO_2 precision data indicating bias that should be corrected.

SECTION 5

CONCLUSIONS AND RECOMMENDATIONS

The charts in the appendices show in graphical form the yearly results of precision checks and accuracy audits for each of the years 1981-1986 for each reporting organization in the nation and reveal a number of persistent and significant trends and relationships. A general improvement in monitoring data quality during these years is indicated. However, significant differences exist among reporting organizations and EPA Regions. These differences warrant continued investigation by the Regional Offices to further improve and make more uniform the quality of data obtained by the ambient air monitoring networks of the nation.

Recommendations are again made that quality control charts, as described and recommended in "Guideline on the Meaning and Use of Precision and Accuracy Data Required by 40 CFR Part 58, Appendices A and B," EPA 600/4-83-023, June 1983,[2] be prepared and maintained in a timely manner for each monitoring site to detect as soon as possible significant trends, biases, and out-of-control conditions. Corrective actions resulting from the appropriate use of control charts for the precision and accuracy data will further improve data quality.

Examples of charts maintained by the State of Florida (included in their quality assurance report) are provided to illustrate how these charts are made and used to detect significant trends and biases that should be investigated and corrected. It is recommended that all the States prepare and issue a quarterly (or annual) quality assurance report similar to that issued by the State of Florida.

REFERENCES

1. Code of Federal Regulations, Title 40, Part 58, "Ambient Air Quality and Surveillance, Appendix A, Quality Assurance Requirements for SLAMS."

2. Evans, E.G., R.C. Rhodes, W.J. Mitchell and J.C. Puzak. "Summary of Precision and Accuracy Assessments for the State and Local Air Monitoring Networks, 1981." Unpublished. U.S. Environmental Protection Agency Report. Research Triangle Park, NC.

3. Evans, E.G., R.C. Rhodes, W.J. Mitchell and J.C. Puzak. "Summary of Precision and Accuracy Assessments for the State and Local Air Monitoring Networks, 1982." EPA-600/4-85-031. U.S. Environmental Protection Agency, Research Triangle Park, NC, April 1985.

4. Rhodes, R.C. and E.G. Evans. "Precision and Accuracy Assessments for State and Local Air Monitoring Networks, 1983." EPA-600/4-86-012. U.S. Environmental Protection Agency, Research Triangle Park, NC, February 1986.

5. Rhodes, R.C. and E.G. Evans. "Precision and Accuracy Assessments for State and Local Air Monitoring Networks, 1984." EPA-600/4-86-031. U.S. Environmental Protection Agency, Research Triangle Park, NC, August 1986.

6. Rhodes, R.C. and E.G. Evans. "Precision and Accuracy Assessments for State and Local Air Monitoring Networks, 1985." EPA-600/4-87-003. U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1987.

7. Rhodes, R.C. and E.G. Evans. "Precision and Accuracy Assessments for State and Local Air Monitoring Networks, 1986." EPA-600/4-88-007. U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1988.

8. Rhodes, R.C. "Guideline on the Meaning and Use of Precision and Accuracy Data Required by 40 CFR Part 58, Appendices A and B." EPA-450/4-84-006. U.S. Environmental Protection Agency, Research Triangle Park, NC, June 1983.

9. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume I, Principles." EPA-600/9-76-005. U.S. Environmental Protection Agency, Research Triangle Park, NC.

10. State of Florida. "The Confidence Limits of Measurements."

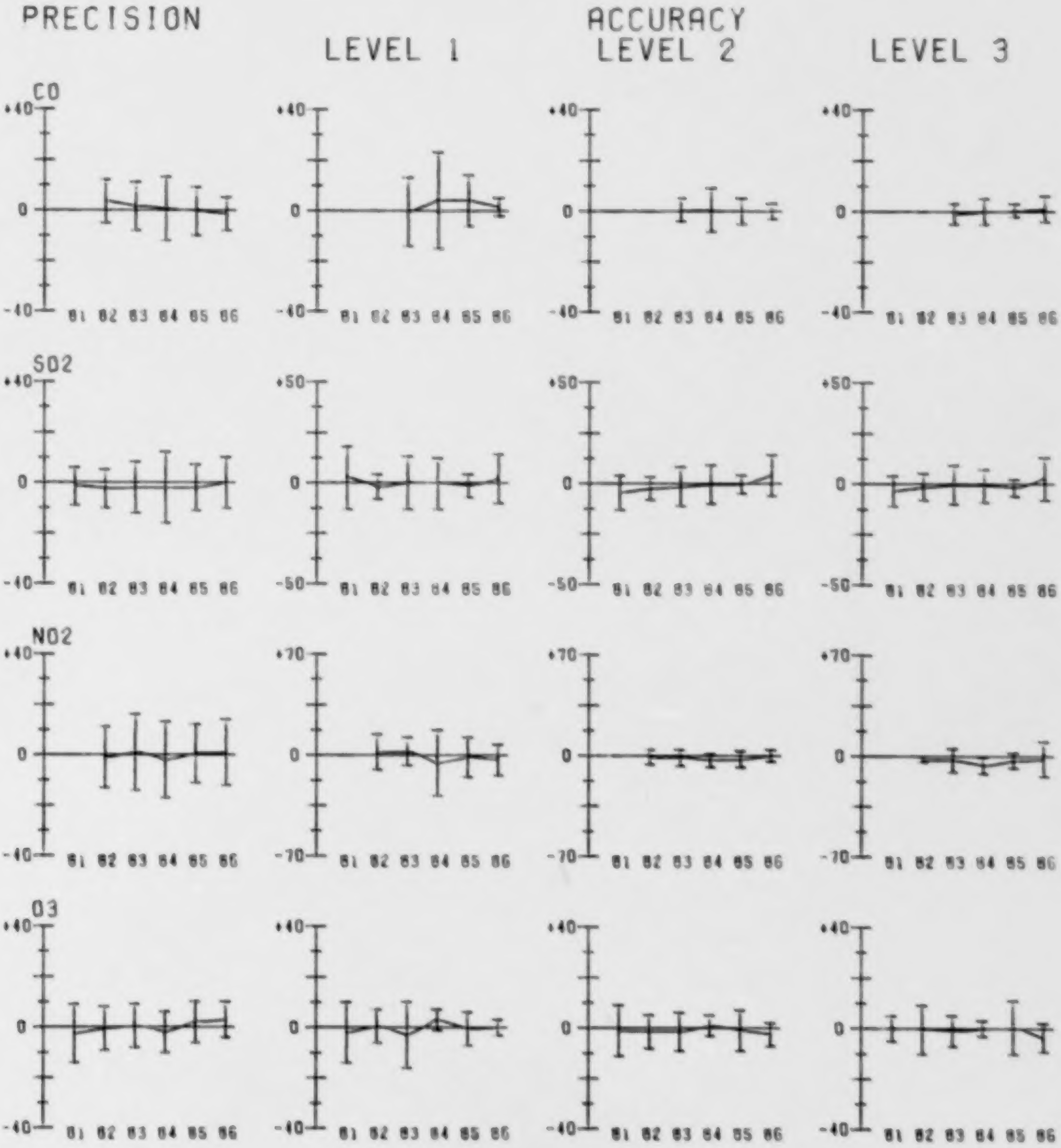
11. "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Specific Methods." EPA-600/4-77-027a. U.S. Environmental Protection Agency, Research Triangle Park, NC.

APPENDIX G

PRECISION AND ACCURACY GRAPHS FOR EACH REPORTING ORGANIZATION

95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 01
STATE : 07 CONNECTICUT
REPORG: 001 AIR MONIT. SEC. DEPT. OF ENV. PROTECT.



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 01
STATE : 07 CONNECTICUT
REPORG: 001 AIR MONIT. SEC. DEPT. OF ENV. PROTECT.

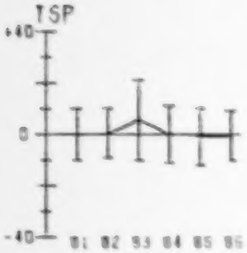
PRECISION

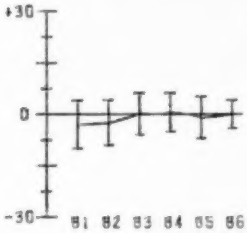
ACCURACY

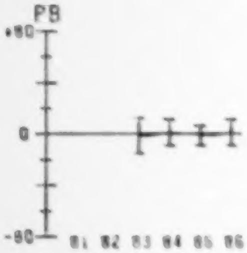
LEVEL 1

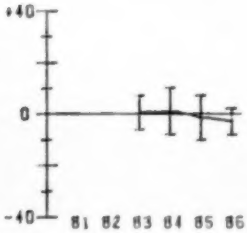
LEVEL 2

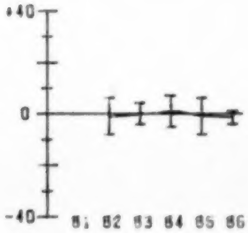
LEVEL 3





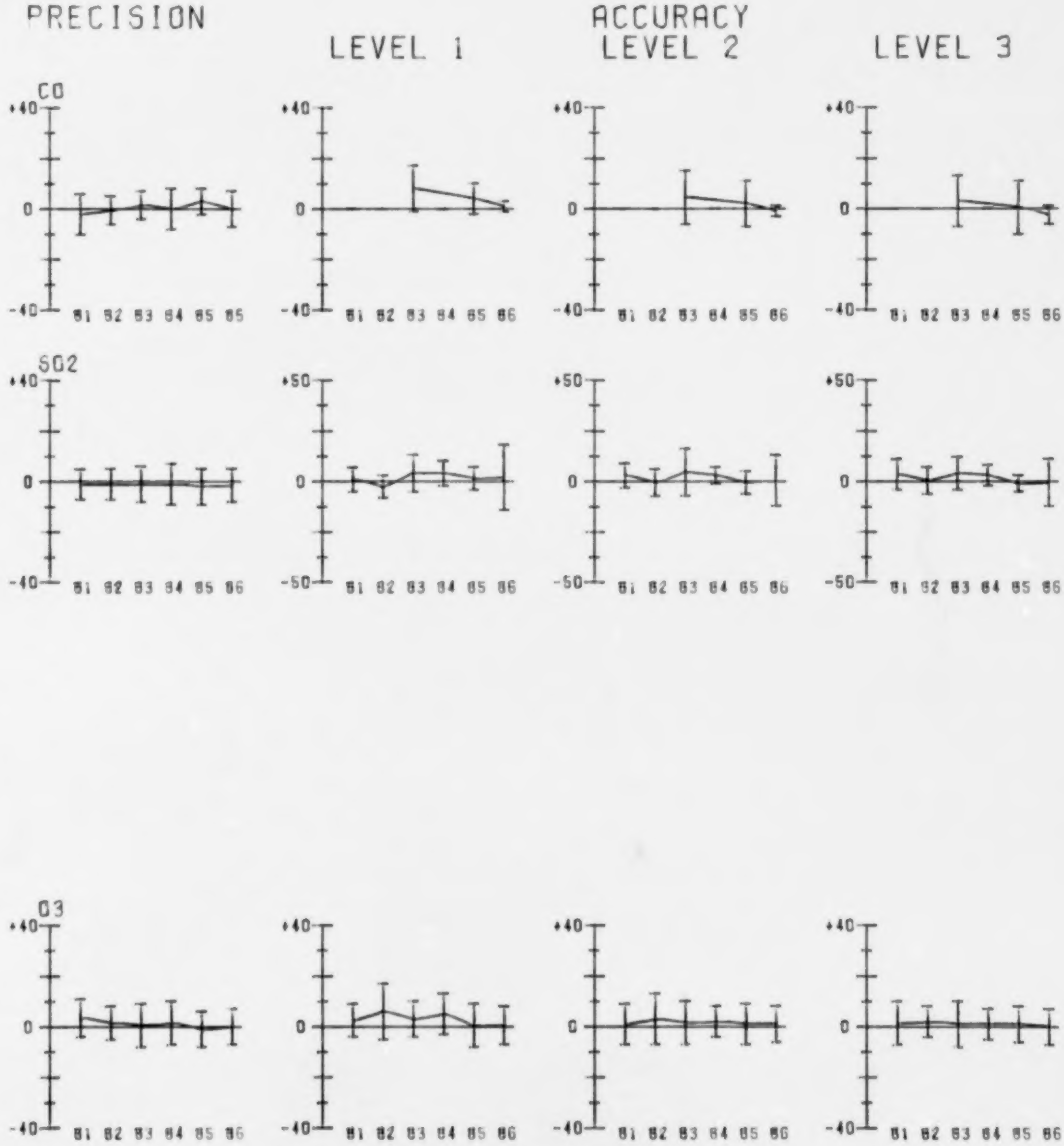






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

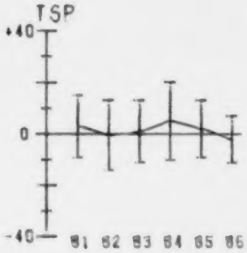
REG   : 01
STATE : 20 MAINE
REPORG : 001 BUREAU OF A. Q. C. DEPT. OF ENV. PROTECT

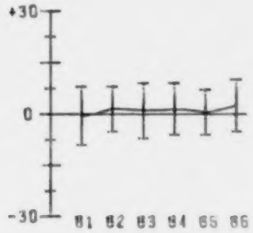


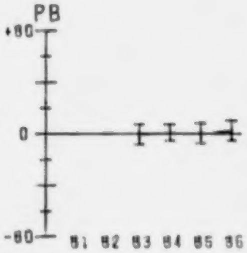
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

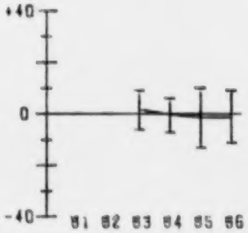
REG : 01
STATE : 20 MAINE
REPORG: 001 BUREAU OF A. Q. C. DEPT. OF ENV. PROTECT

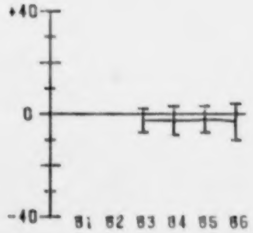
PRECISION	ACCURACY LEVEL 1	ACCURACY LEVEL 2	ACCURACY LEVEL 3









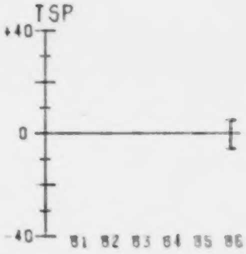


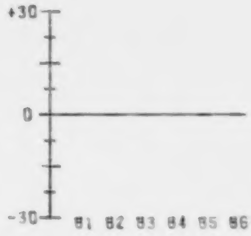
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 01
STATE : 20 MAINE
REPORG: 101 S.D. WARREN CO., WESTBROOK

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

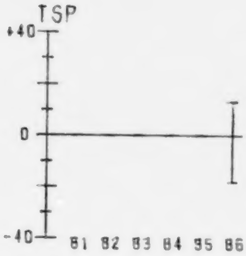




95% PROBABILITY LIMITS 81-86
MANUAL METHODS

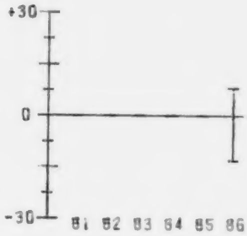
REG : 01
STATE : 20 MAINE
REPORG: 102 S.D. WARREN CO., HINKLEY

PRECISION



LEVEL 1

ACCURACY
LEVEL 2



LEVEL 3

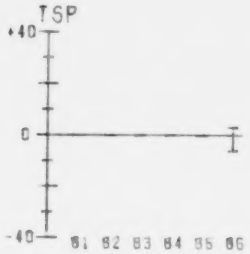
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

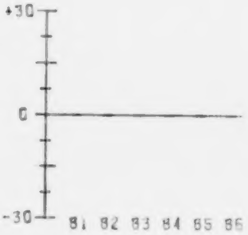
REG : 01
STATE : 20 MAINE
REPORG: 103 INTERNATIONAL PAPER CO., JAY

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 01
STATE : 20 MAINE
REPORG : 104 BOISE CASCADE CO., RUMFORD

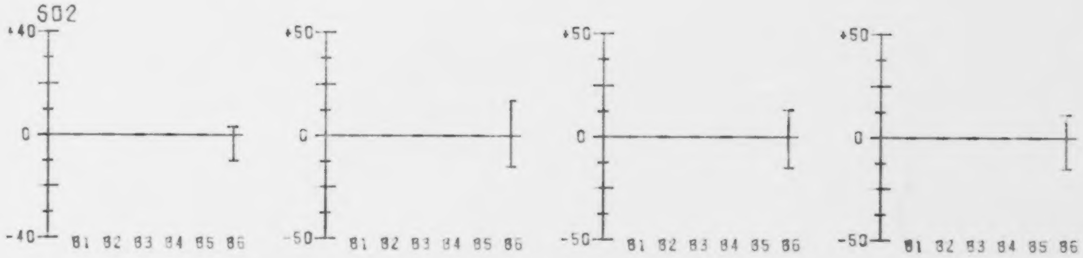
PRECISION

ACCURACY

LEVEL 1

LEVEL 2

LEVEL 3



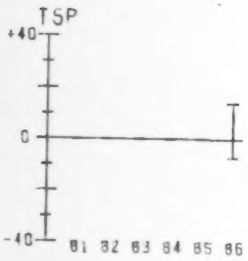
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

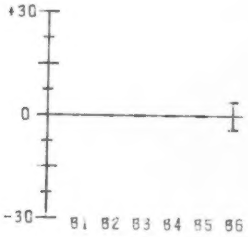
REG : 01
STATE : 20 MAINE
REPORG: 104 BOISE CASCADE CO., RUMFORD

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3





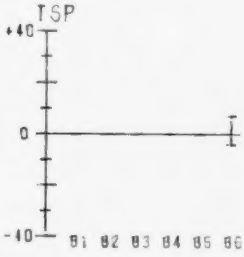
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

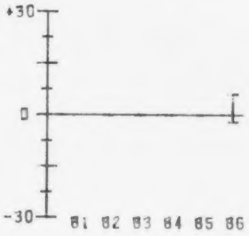
REG : 01
STATE : 20 MAINE
REPORG: 106 DRAGON PRODUCTS, THOMASTON

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



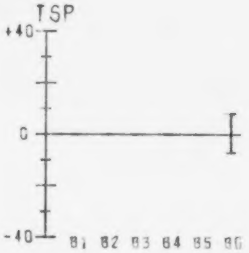


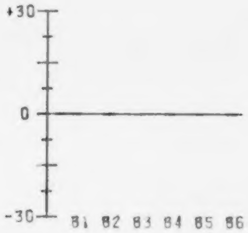
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 01
STATE : 20 MAINE
REPORG: 107 SCOTT PAPER CO., WINSLOW

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





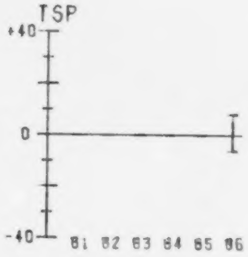
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

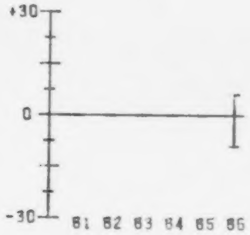
REG : 01
STATE : 20 MAINE
REPORG: 108 CHAMPION INTERNATIONAL CORP., BUCKSPORT

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3





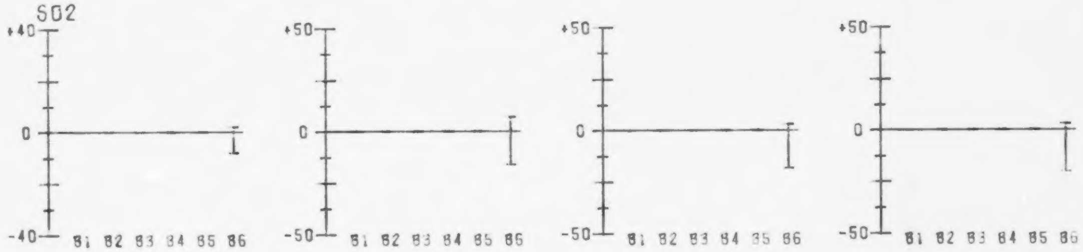
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 01
STATE : 20 MAINE
REPORG : 109 LINCOLN PULP AND PAPER CO., LINCOLN

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3

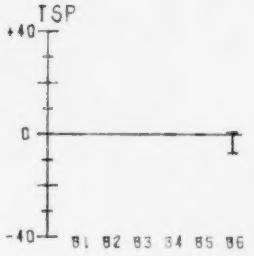


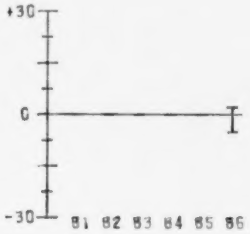
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 01
STATE : 20 MAINE
REPORG: 109 LINCOLN PULP AND PAPER CO., LINCOLN

PRECISION ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3





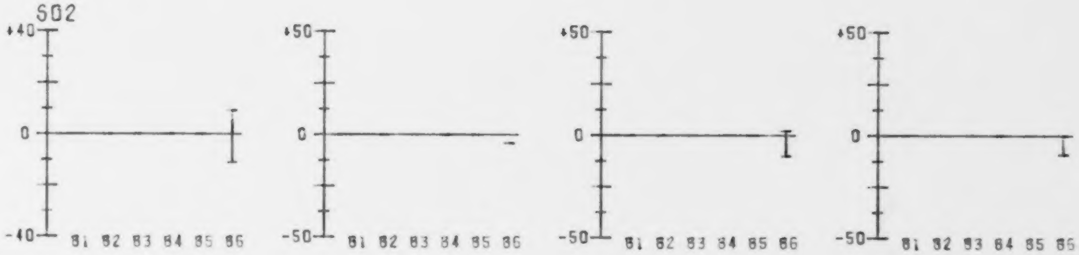
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 01
STATE : 20 MAINE
REPORG: 110 GREAT NORTHERN PAPER CO., MILLINOCKE

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



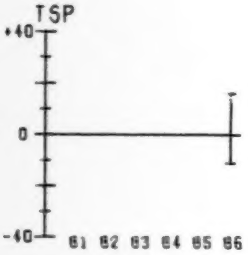
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

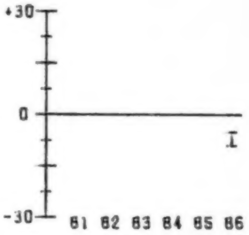
REG : 01
STATE : 20 MAINE
REPORG: 110 GREAT NORTHERN PAPER CO., MILLINOCKE

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3

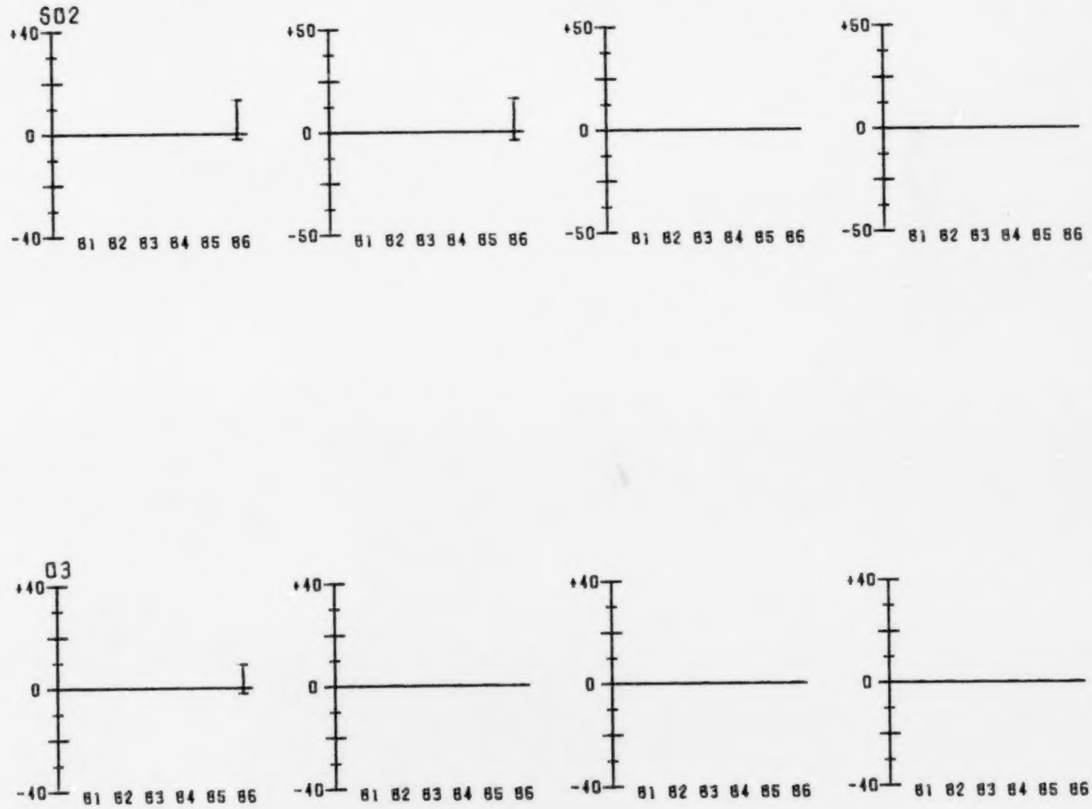




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 01
STATE : 20   MAINE
REPORG: 112   GEORGIA PACIFIC CO., WOODLAND

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 01
STATE : 20 MAINE
REPORG: 112 GEORGIA PACIFIC CO., WOODLAND

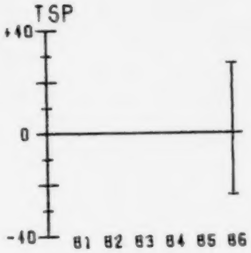
PRECISION

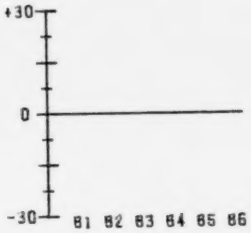
ACCURACY

LEVEL 1

LEVEL 2

LEVEL 3



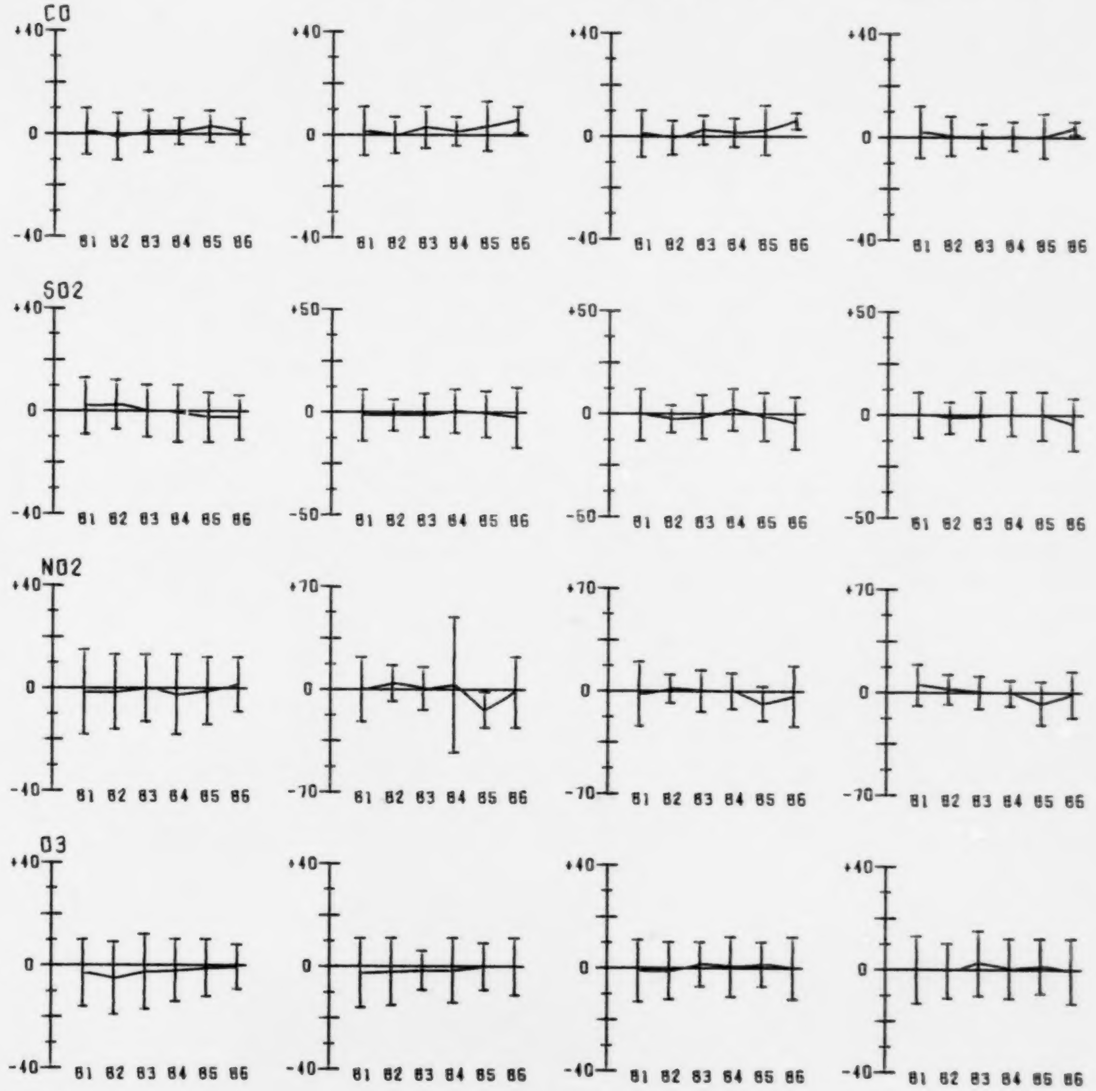


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 01
STATE : 22 MASSACHUSETTS
REPORG: 001 DEPARTMENT OF ENV. QUALITY ENGINEERING

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



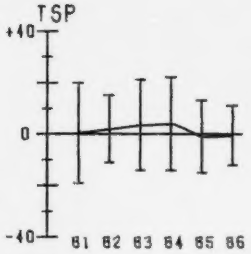
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

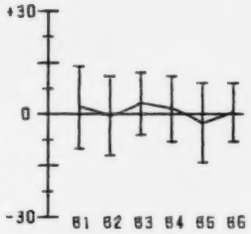
REG : 01
STATE : 22 MASSACHUSETTS
REPORG: 001 DEPARTMENT OF ENV. QUALITY ENGINEERING

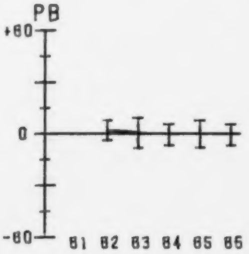
PRECISION

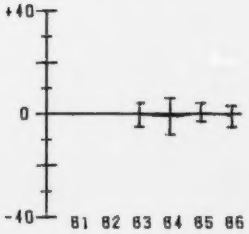
ACCURACY

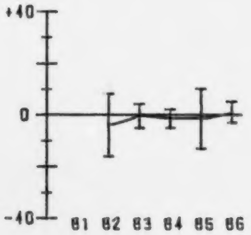
LEVEL 1 LEVEL 2 LEVEL 3







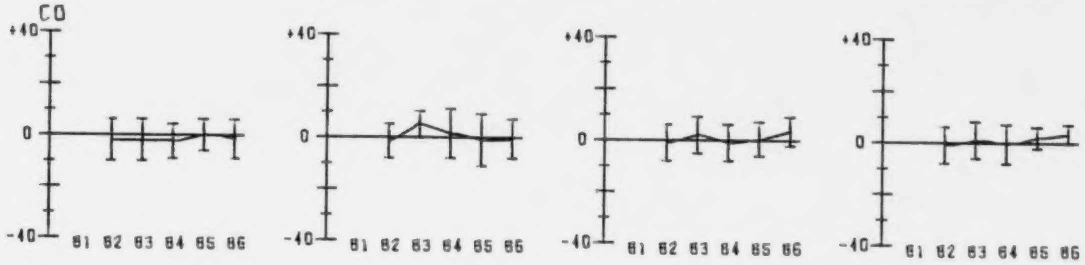


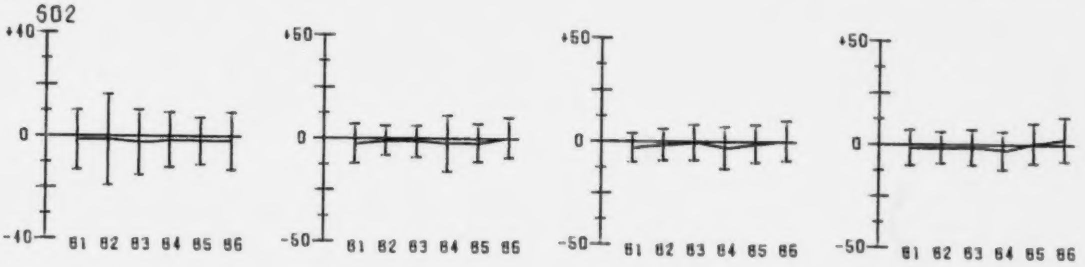


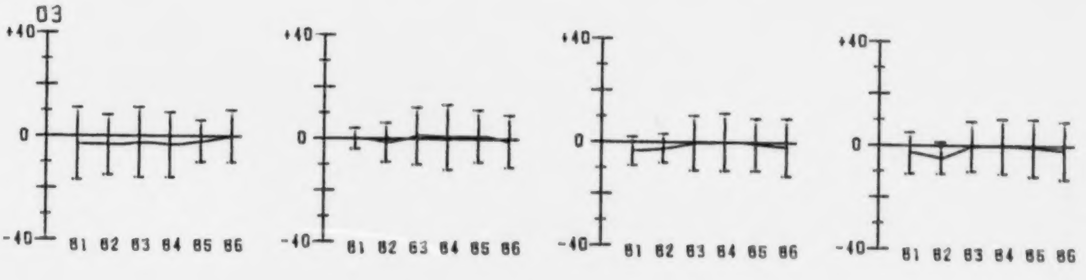
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 01
STATE : 30 NEW HAMPSHIRE
REPORG: 001 AIR RESOURCES AGENCY

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



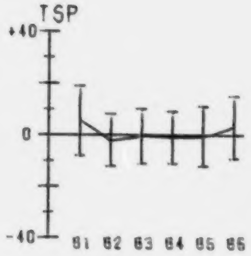


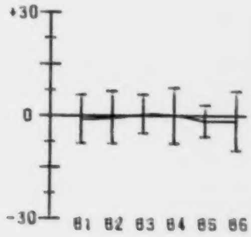


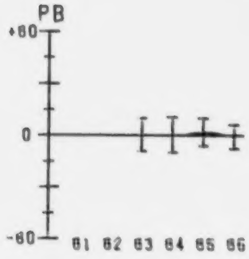
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

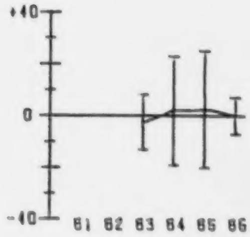
REG : 01
STATE : 30 NEW HAMPSHIRE
REPORG: 001 AIR RESOURCES AGENCY

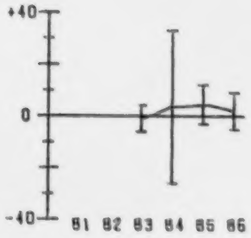
PRECISION	LEVEL 1	ACCURACY LEVEL 2	LEVEL 3





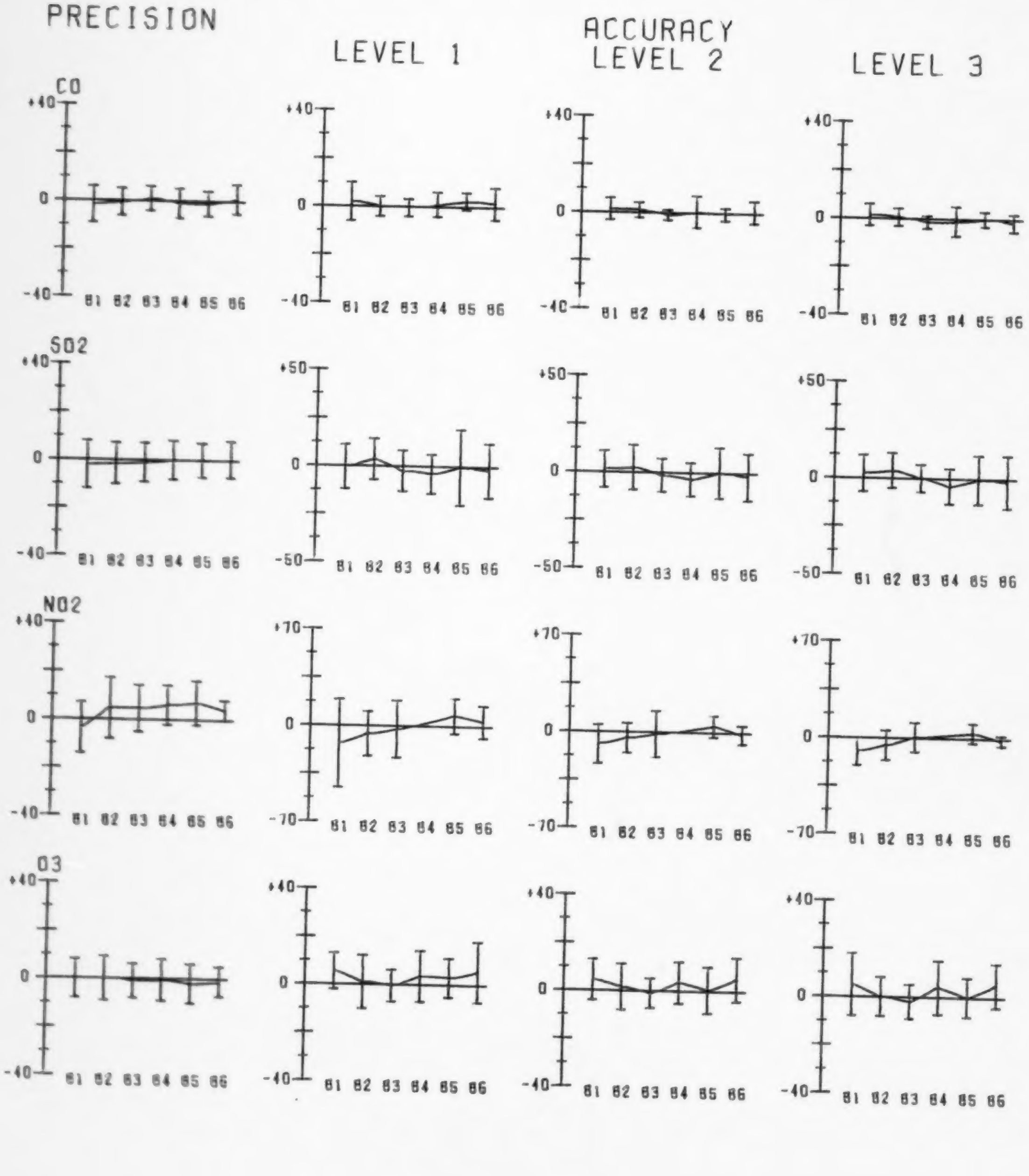






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

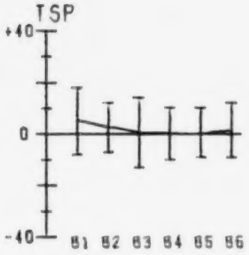
REG : 01
STATE : 41 RHODE ISLAND
REPORG: 001 DIV. OF A. HAZ. MAT. DEPT OF ENV. MANAGE

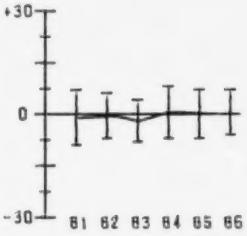


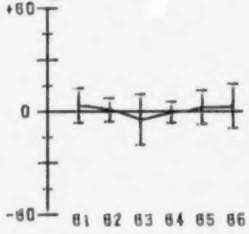
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

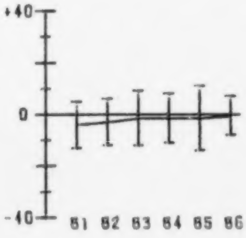
REG   : 01
STATE : 41 RHODE ISLAND
REPORG : 001 DIV. OF A. HAZ. MAT. DEPT OF ENV. MANAGE

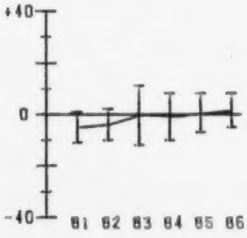
PRECISION | ACCURACY LEVEL 1 | LEVEL 2 | LEVEL 3





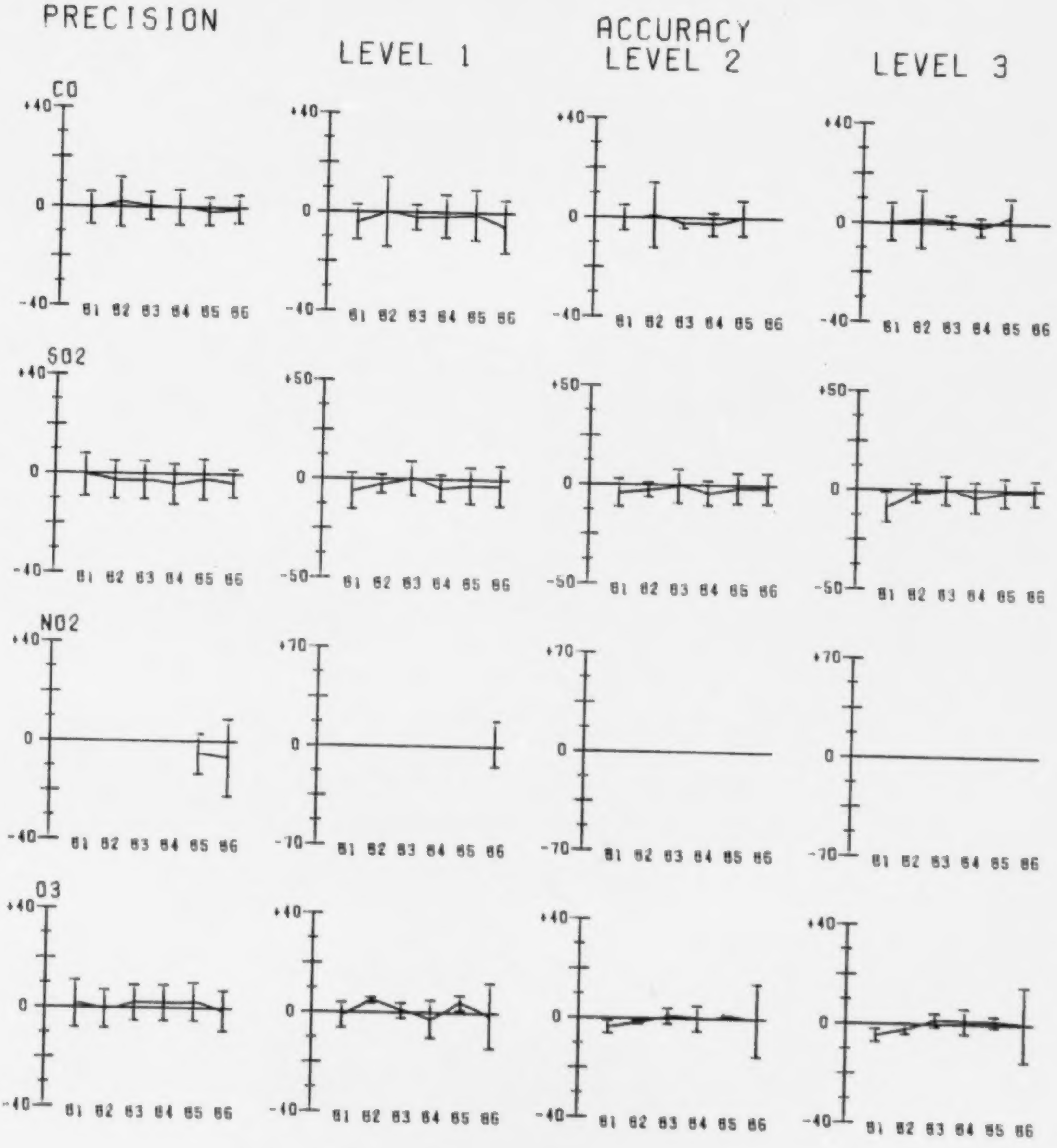






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 01
STATE : 47 VERMONT
REPORG: 001 AIR & SOLID WASTE PROGRAMS

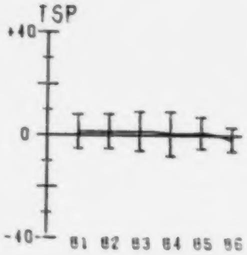


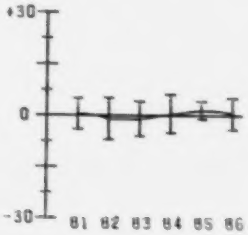
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 01
STATE : 47 VERMONT
REPORG: 001 AIR & SOLID WASTE PROGRAMS

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



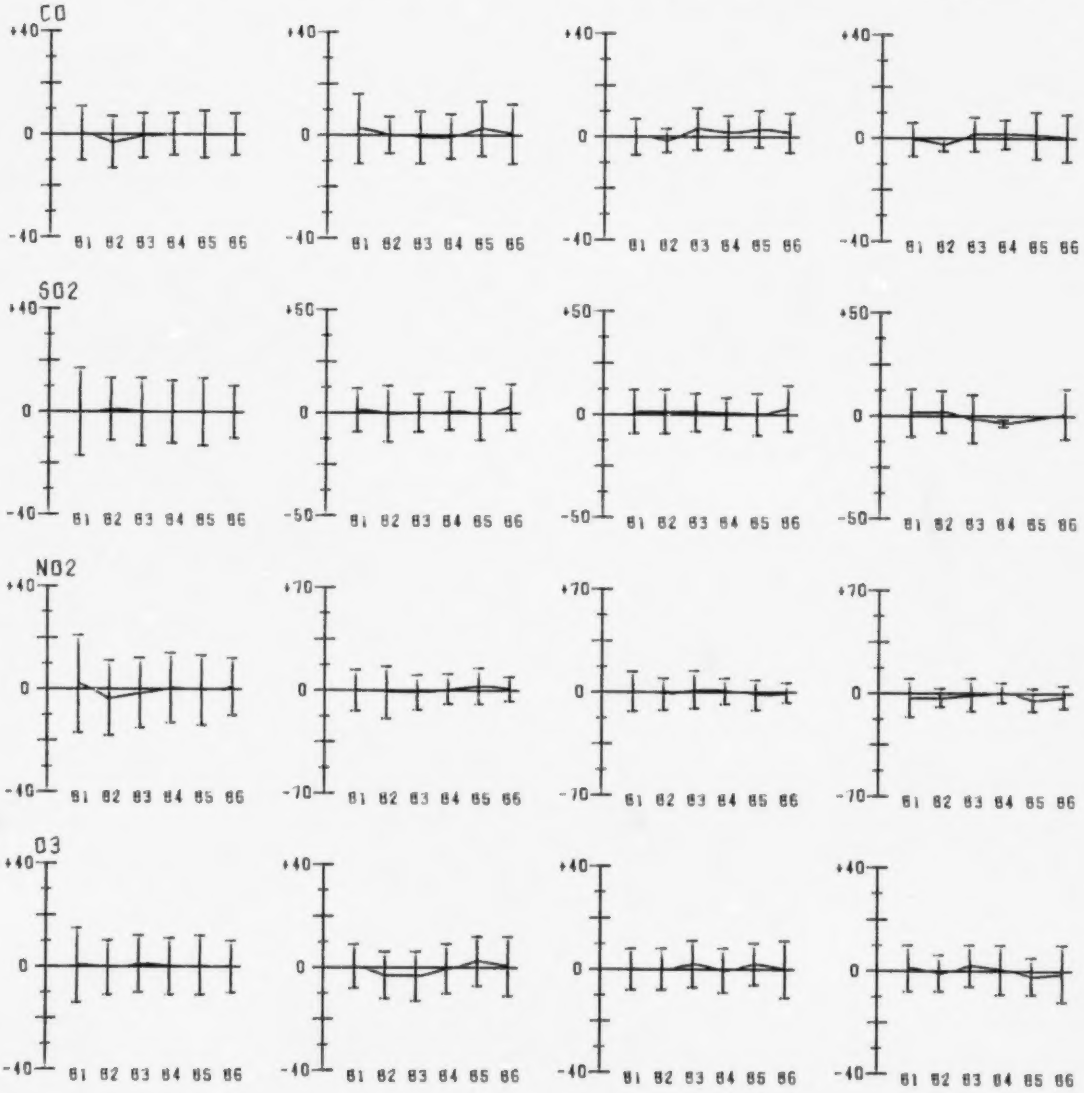


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 02
STATE : 31 NEW JERSEY
REPORG: 001 DEPT. OF ENV.PROT., DIV. OF ENV. QUAL.

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



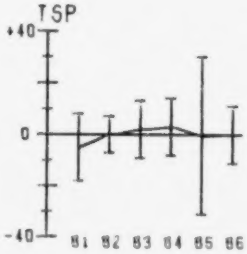
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

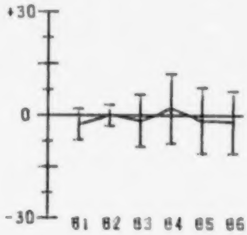
REG : 02
STATE : 31 NEW JERSEY
REPORG: 001 DEPT. OF ENV.PROT.. DIV. OF ENV. QUAL.

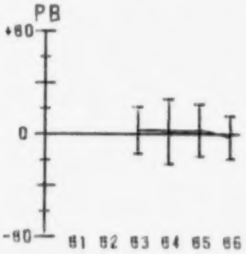
PRECISION

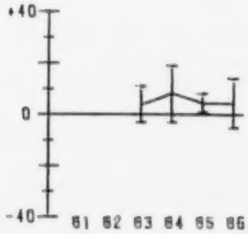
ACCURACY

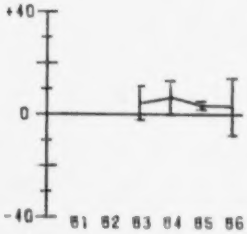
LEVEL 1 LEVEL 2 LEVEL 3





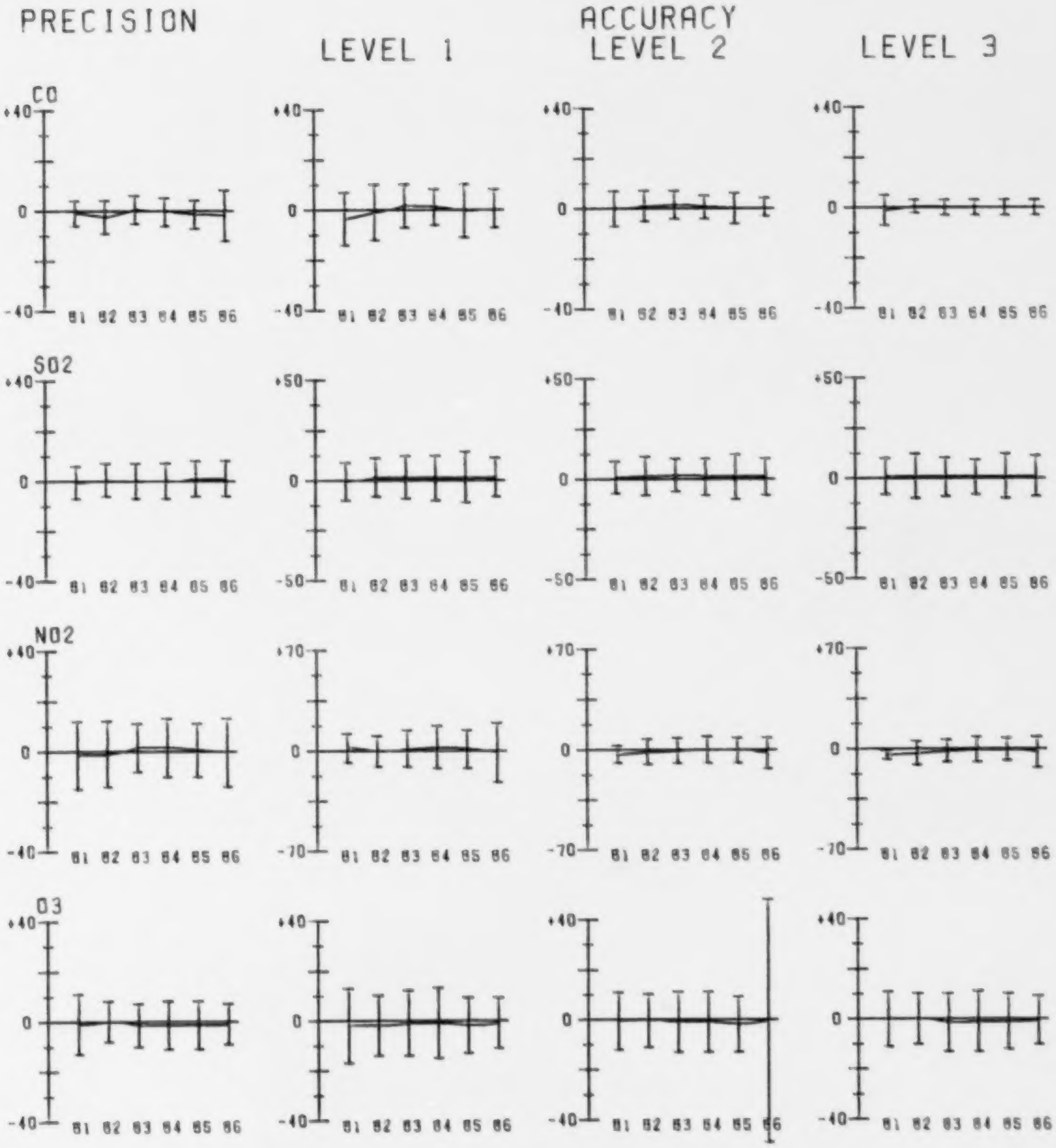






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 02
STATE : 33 NEW YORK
REPORG: 001 DEPT. OF ENV. CONSERV. DIV. OF AIR



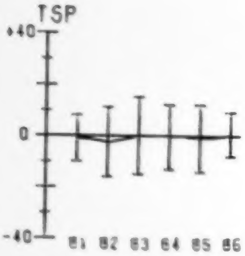
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

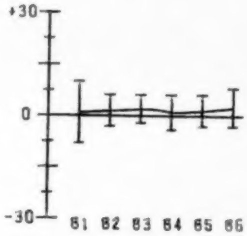
REG : 02
STATE : 33 NEW YORK
REPORG: 001 DEPT. OF ENV. CONSERV. DIV. OF AIR

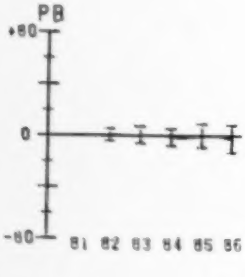
PRECISION

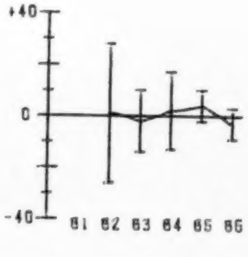
ACCURACY

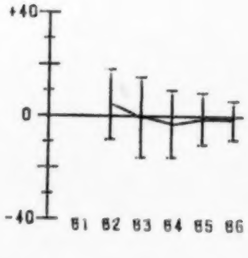
LEVEL 1 LEVEL 2 LEVEL 3





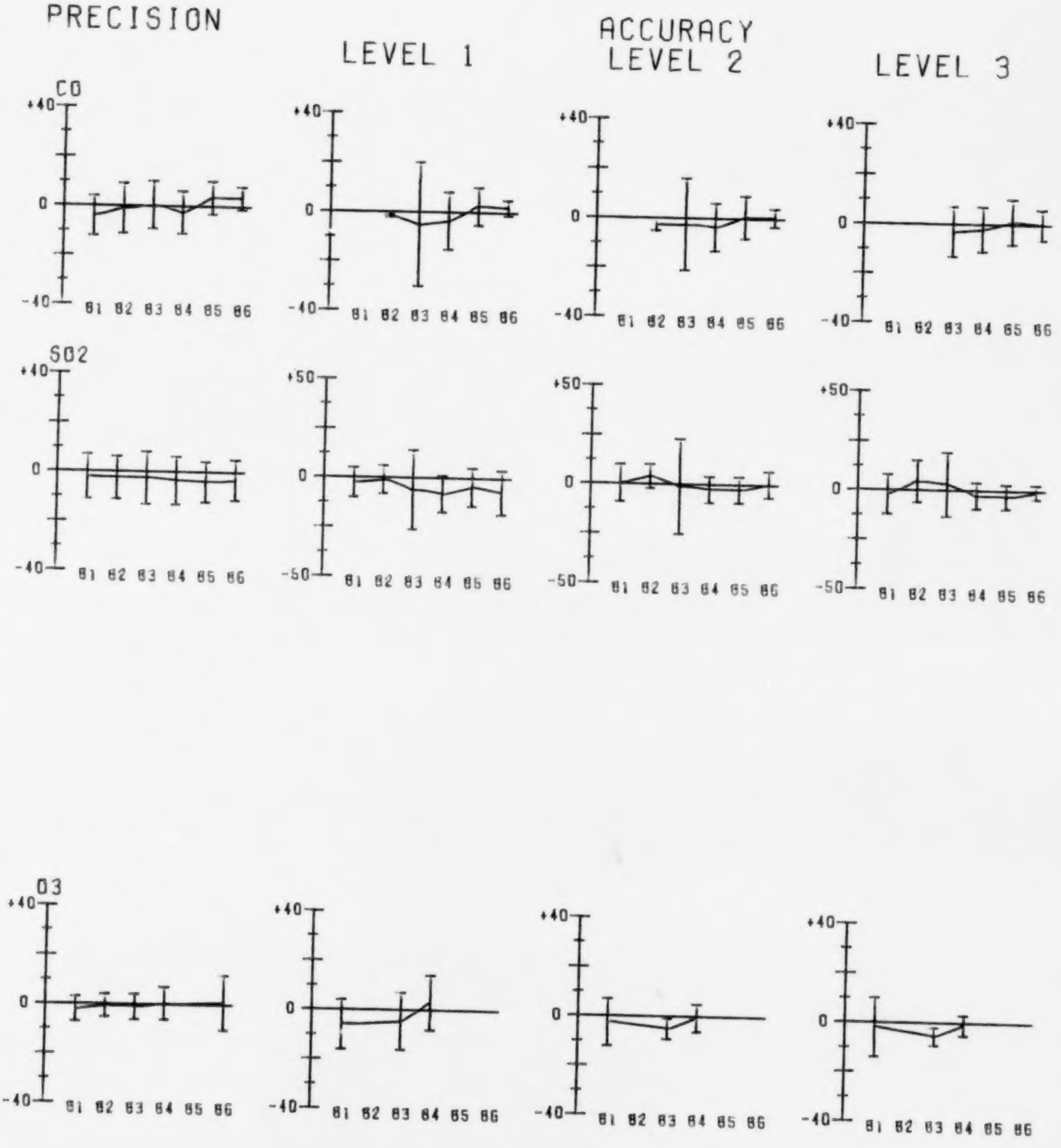






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

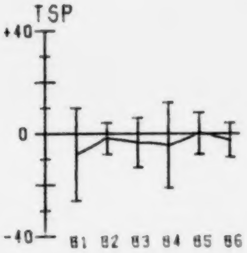
REG : 02
STATE : 40 PUERTO RICO
REPORG: 001 ENVIRONMENTAL QUALITY BOARD.

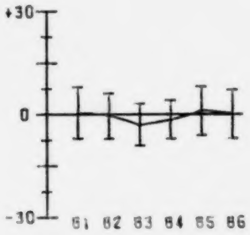


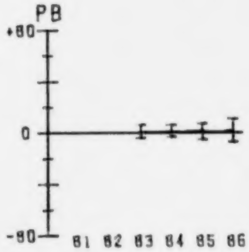
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

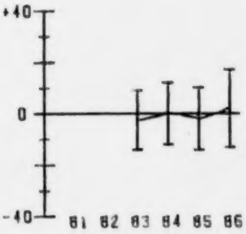
REG   : 02
STATE : 40   PUERTO RICO
REPORG: 001 ENVIRONMENTAL QUALITY BOARD.

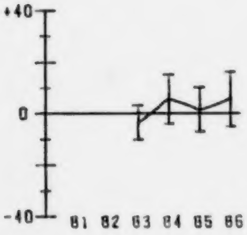
PRECISION — LEVEL 1 — ACCURACY LEVEL 2 — LEVEL 3











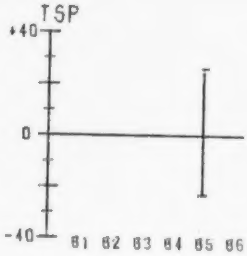
```
                 95% PROBABILITY LIMITS 81-86
                      CONTINUOUS METHODS
REG    : 02
STATE  : 55   VIRGIN ISLANDS
REPORG : 001  DEPT. OF CONS. AND CULTURAL AFFAIRS

 PRECISION                          ACCURACY
                  LEVEL 1           LEVEL 2           LEVEL 3
```

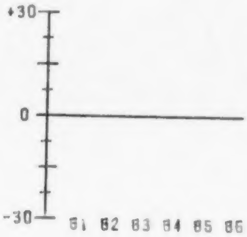
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 02
STATE : 55 VIRGIN ISLANDS
REPORG: 001 DEPT. OF CONS. AND CULTURAL AFFAIRS

PRECISION

ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3





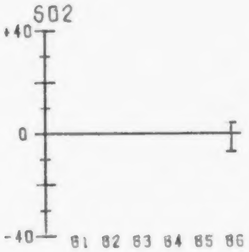
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

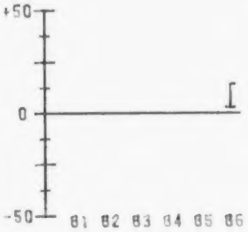
REG   : 02
STATE : 55 VIRGIN ISLANDS
REPORG : 002 MARTIN MARIETTA

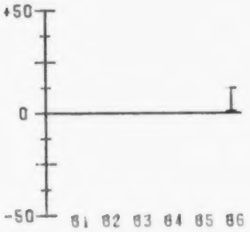
PRECISION

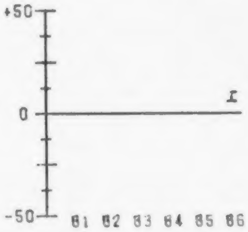
ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3



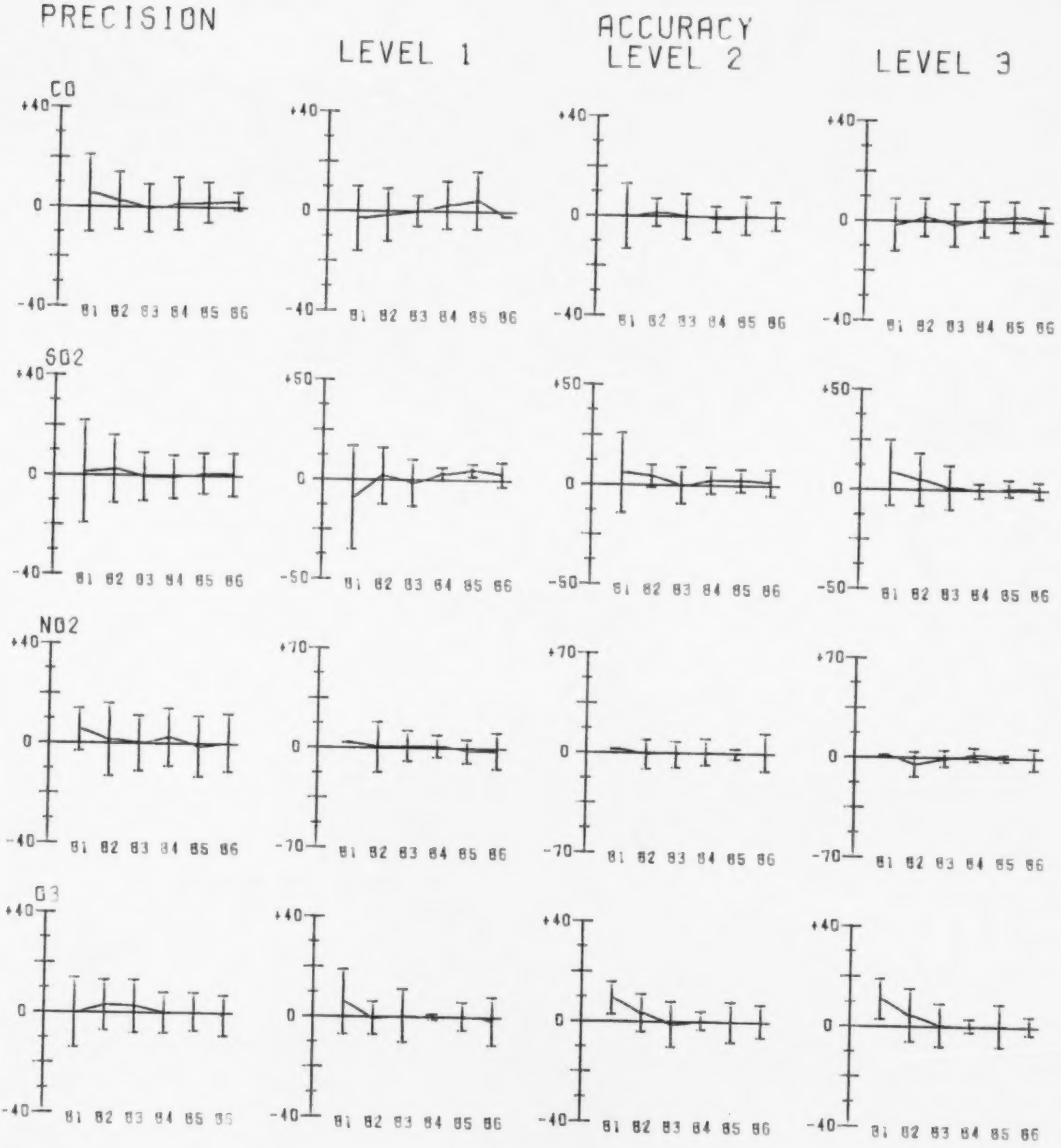






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

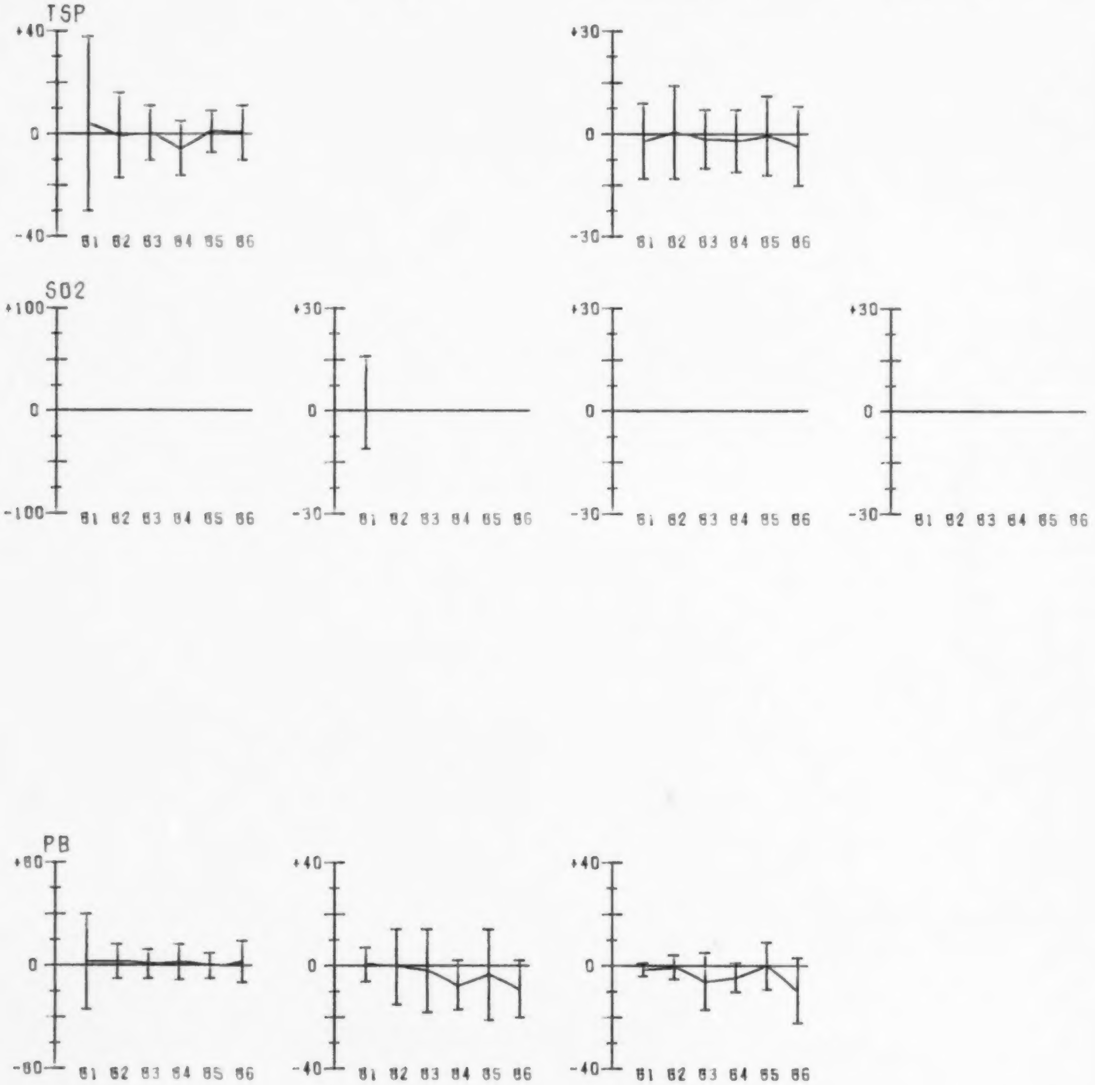
REG   : 03
STATE : 08 DELAWARE
REPORG : 001 STATE OF DELAWARE DNR & EC



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

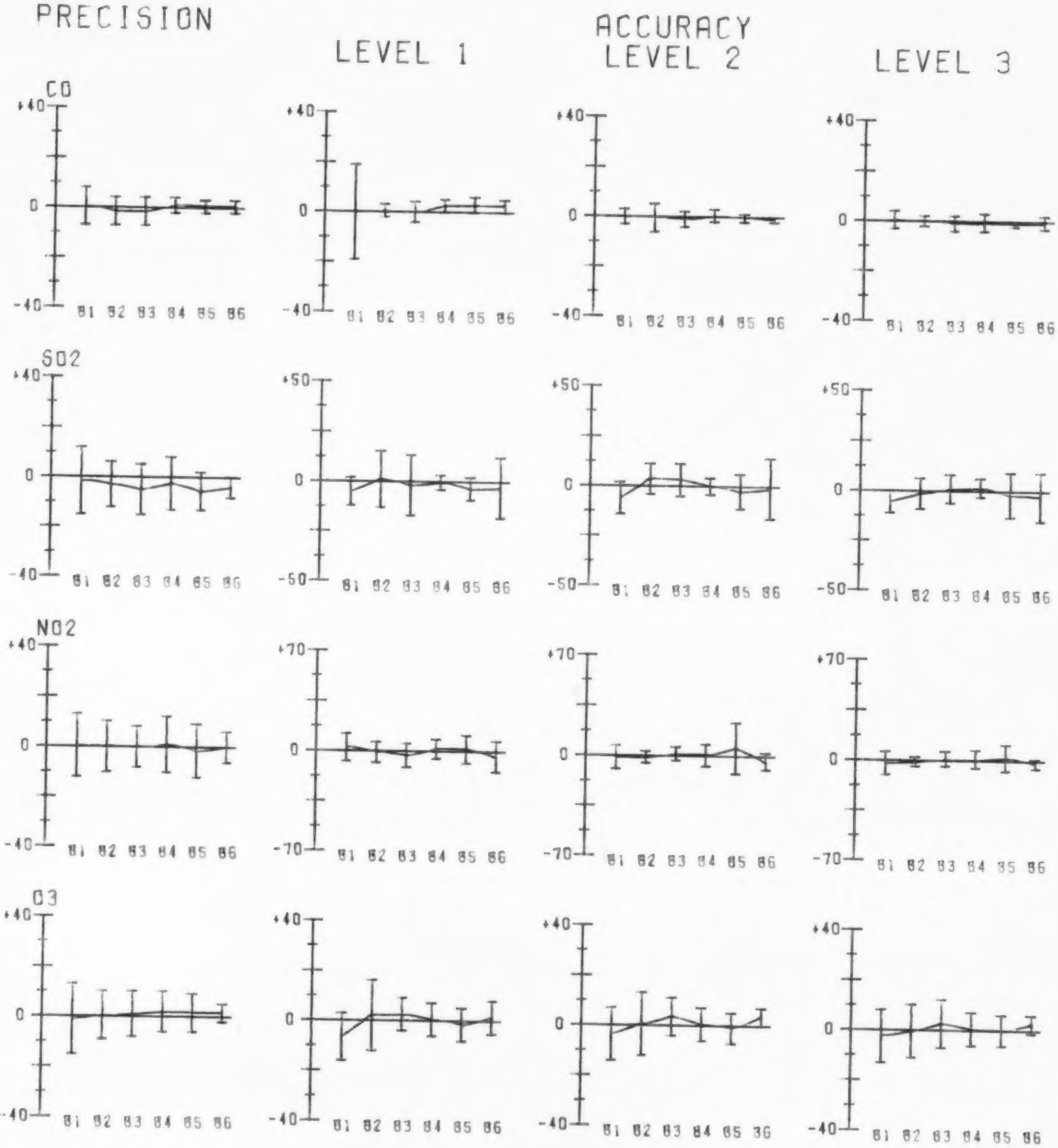
REG   : 03
STATE : 08 DELAWARE
REPORG : 001 STATE OF DELAWARE DNR & EC

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 03
STATE : 09 DST. OF COLUMB.
REPORG: 001 WASHINGTON, DC DC & RA



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 03
STATE : 09 DST. OF COLUMB.
REPORG: 001 WASHINGTON, DC DC & RA

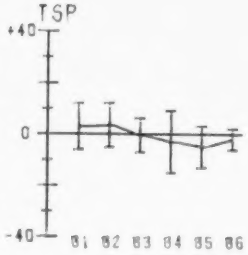
PRECISION

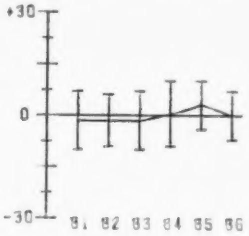
ACCURACY

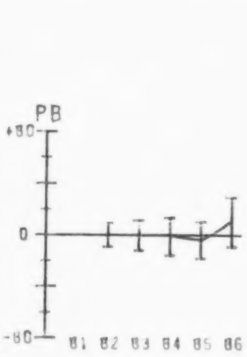
LEVEL 1

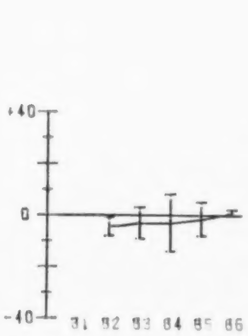
LEVEL 2

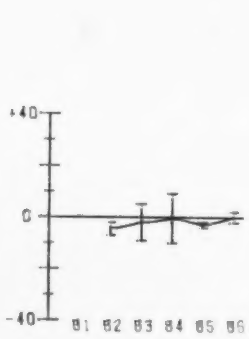
LEVEL 3









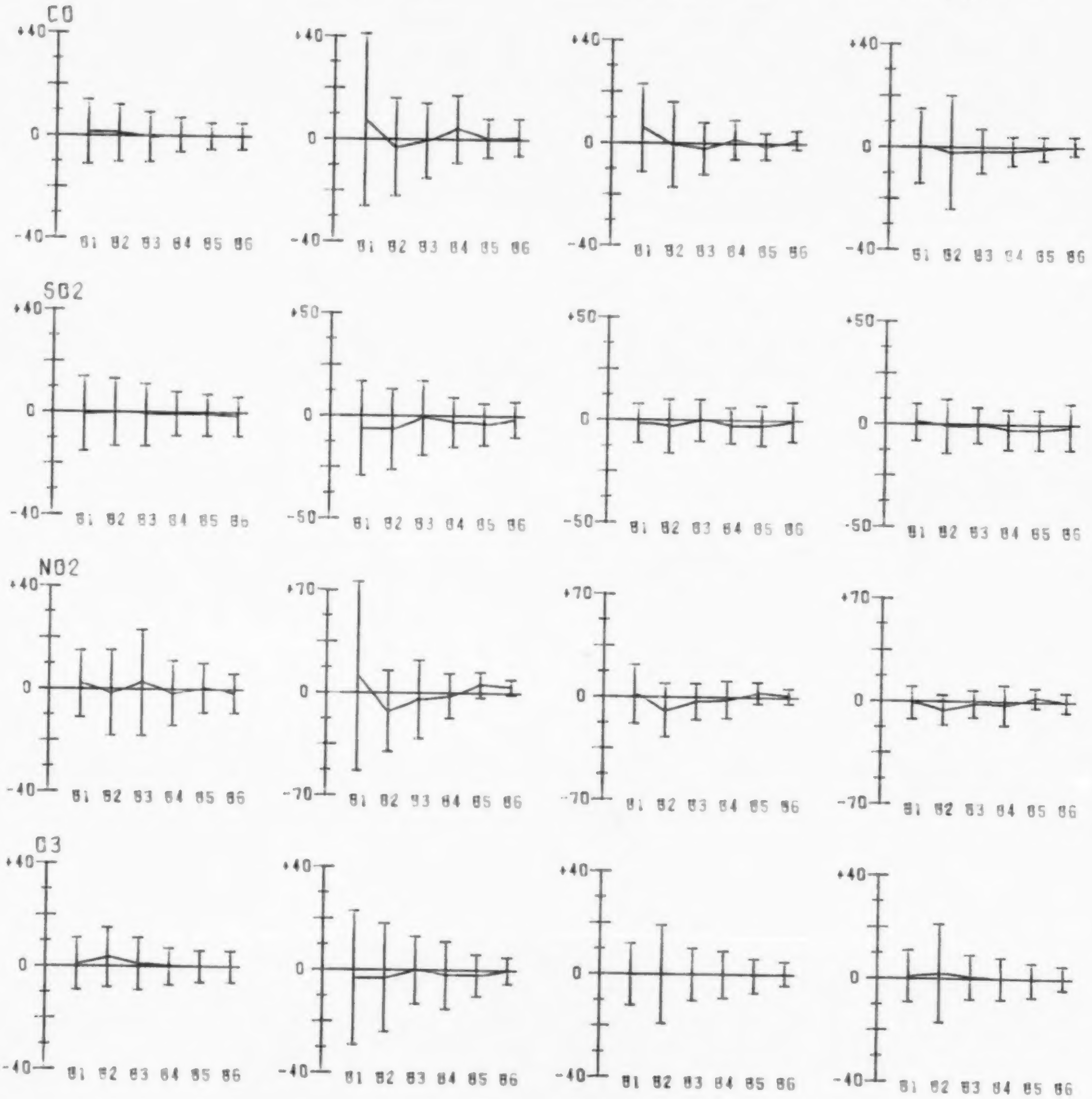


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 21 MARYLAND
REPORG: 001 STATE OF MARYLAND

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 03
STATE : 21 MARYLAND
REPORG: 001 STATE OF MARYLAND

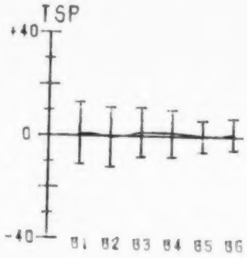
PRECISION

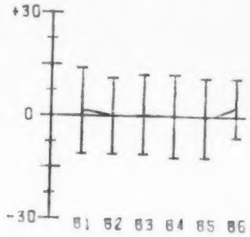
ACCURACY

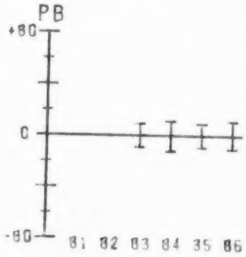
LEVEL 1

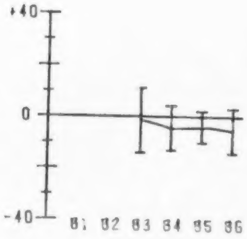
LEVEL 2

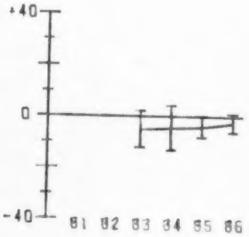
LEVEL 3











95% PROBABILITY LIMITS 81-86
MANUAL METHODS

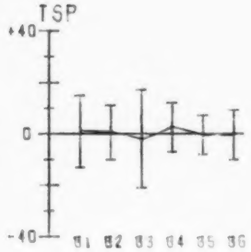
REG : 03
STATE : 21 MARYLAND
REPORG: 002 ALLEGANY COUNTY

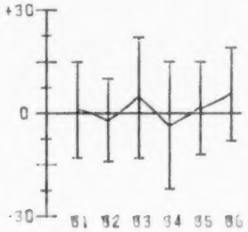
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

LEVEL 3





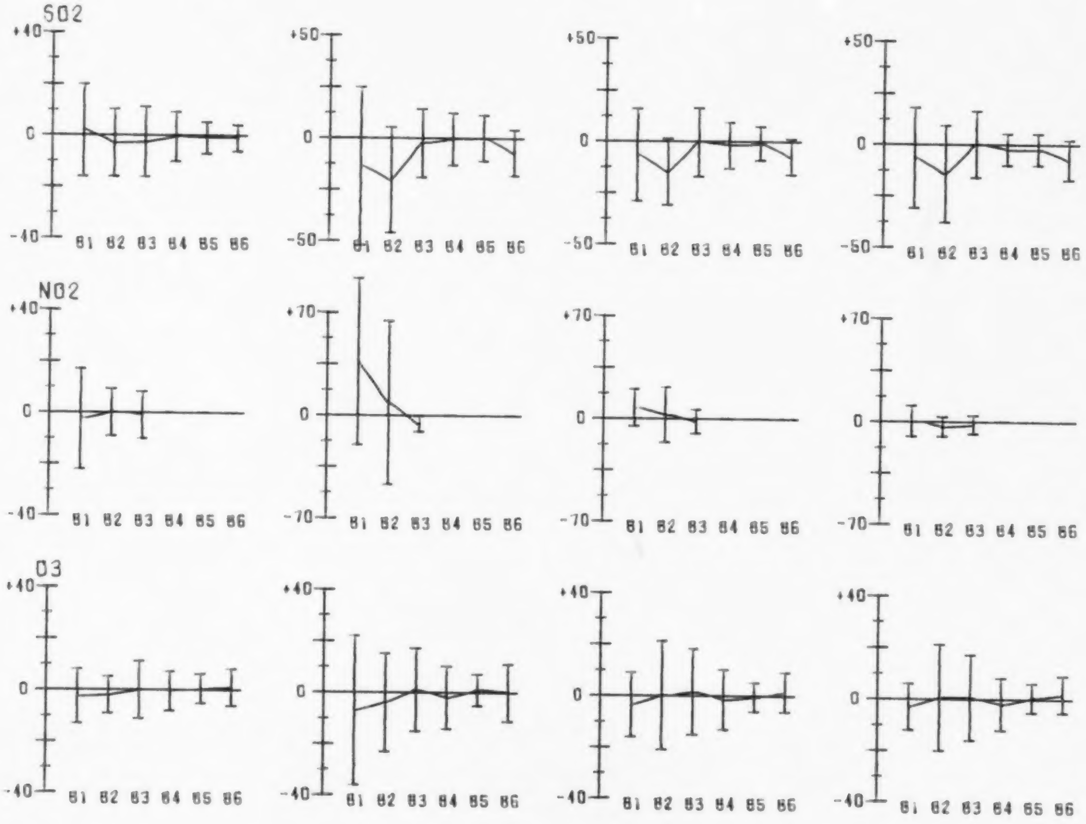
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 21 MARYLAND
REPORG: 003 ANNE ARUNDEL COUNTY

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3

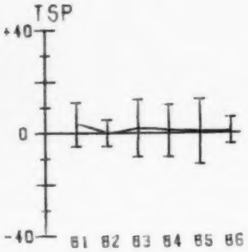


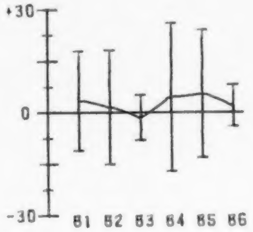
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 03
STATE : 21 MARYLAND
REPORG: 003 ANNE ARUNDEL COUNTY

PRECISION

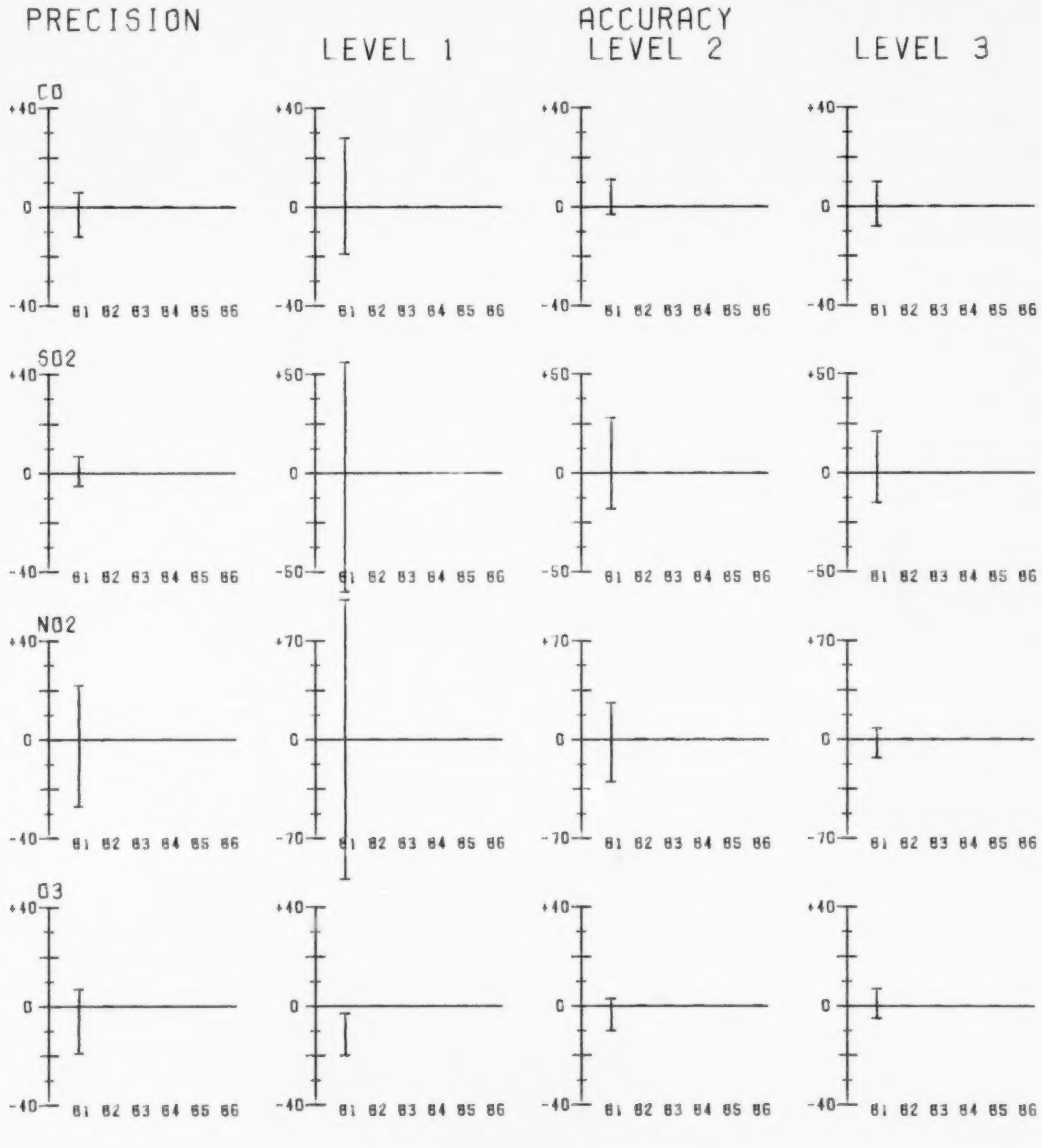
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

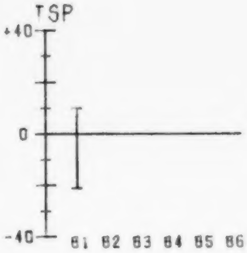
REG   : 03
STATE : 21 MARYLAND
REPORG : 004 BALTIMORE CITY (DISC. 1/82)

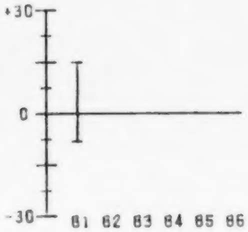


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 03
STATE : 21   MARYLAND
REPORG : 004 BALTIMORE CITY   (DISC. 1/82)

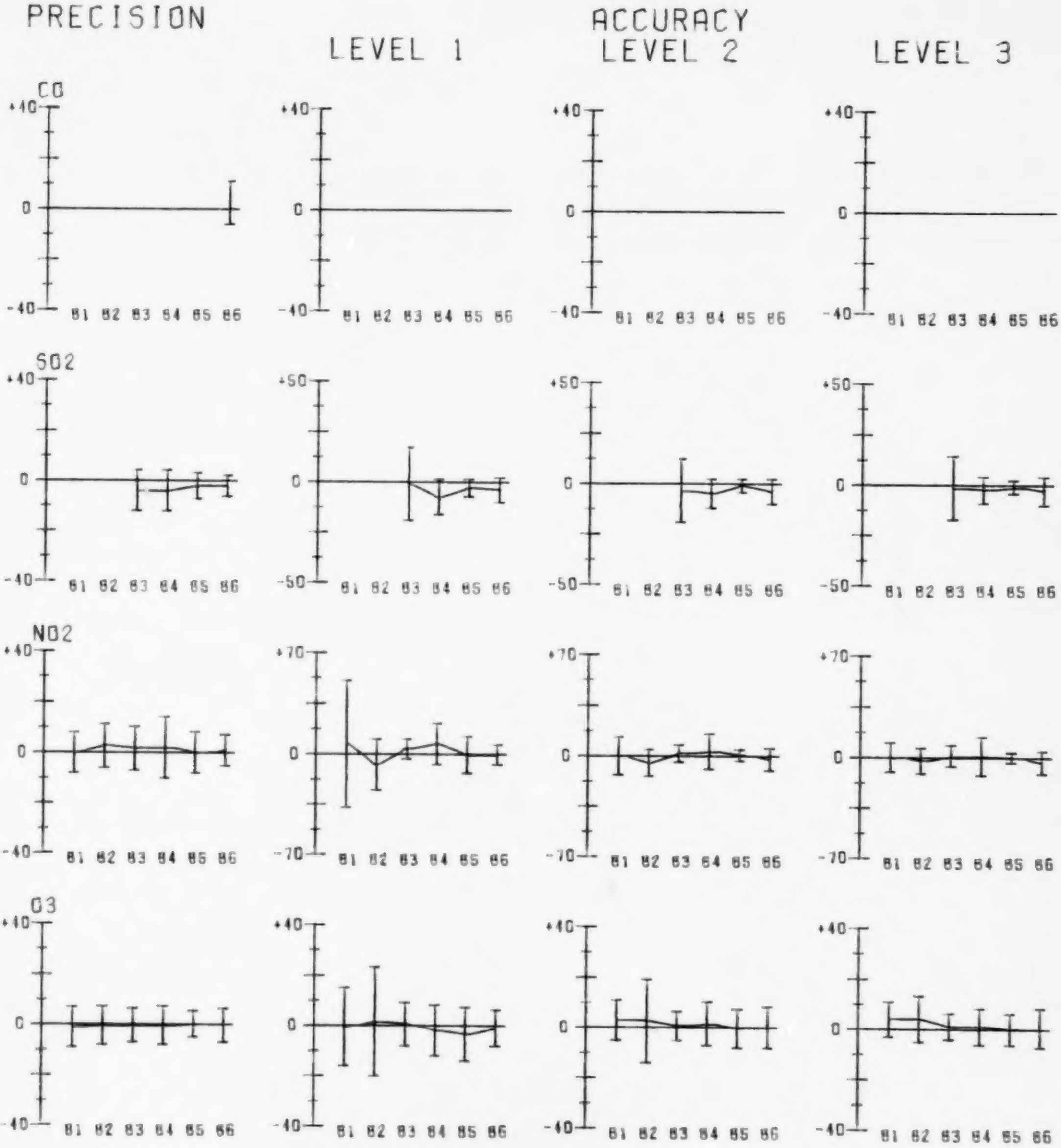
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 21 MARYLAND
REPORG: 005 BALTIMORE COUNTY



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 03
STATE : 21 MARYLAND
REPORG: 005 BALTIMORE COUNTY

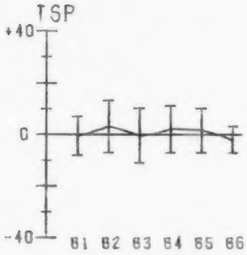
PRECISION

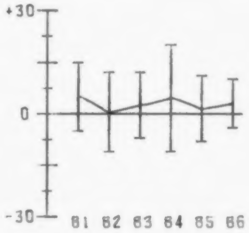
ACCURACY

LEVEL 1

LEVEL 2

LEVEL 3





95% PROBABILITY LIMITS 81-86
MANUAL METHODS

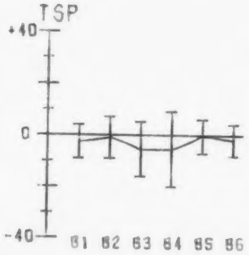
REG : 03
STATE : 21 MARYLAND
REPORG: 006 PRINCE GEORGE'S COUNTY

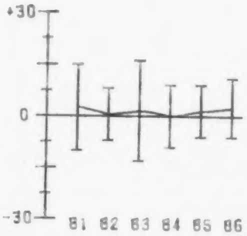
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

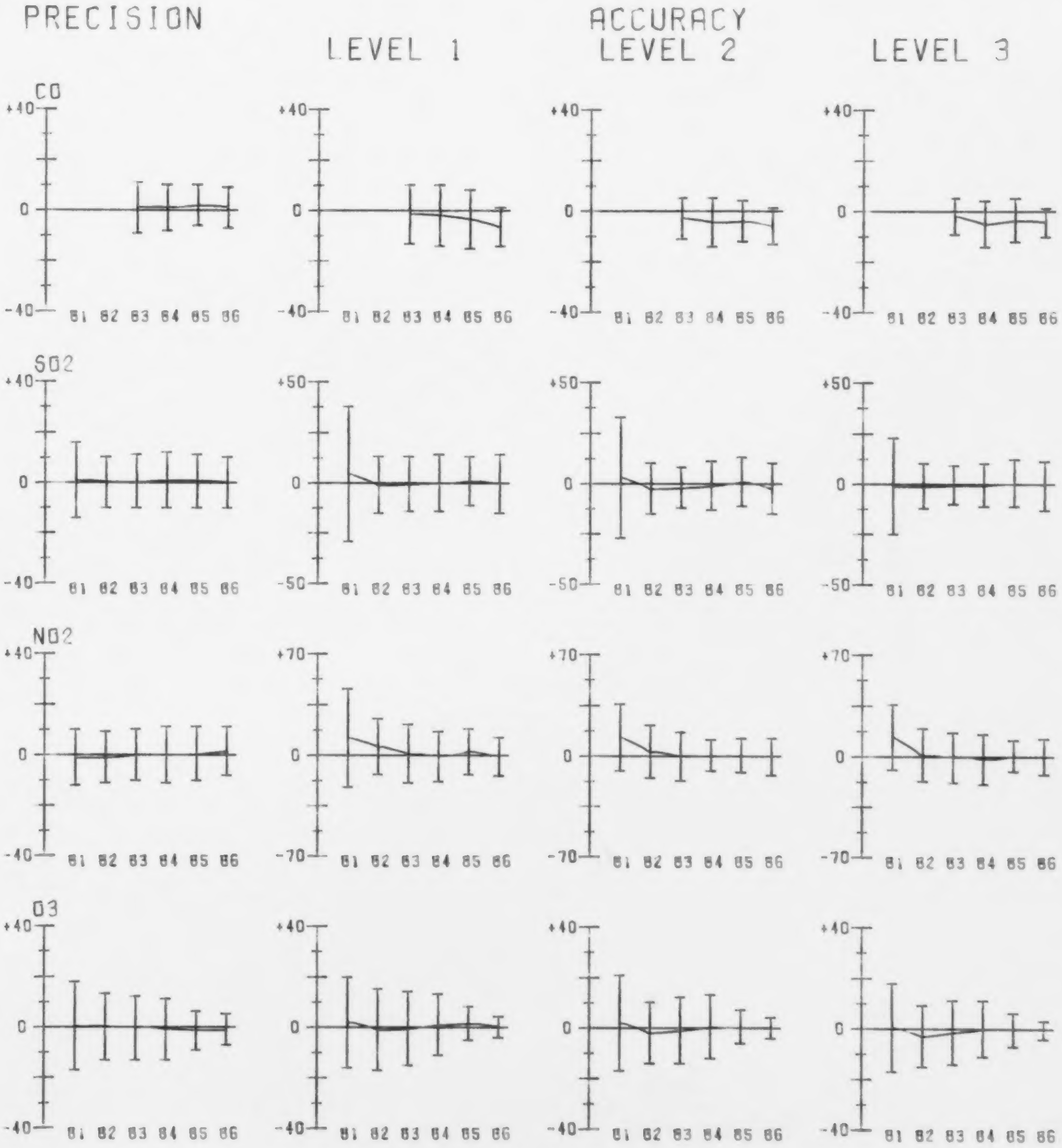
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 03
STATE : 39 PENNSYLVANIA
REPORG : 001 PENNSYLVANIA DER

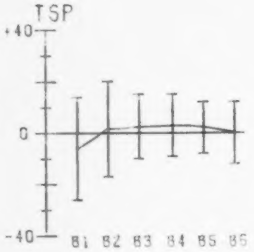


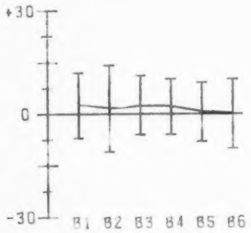
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

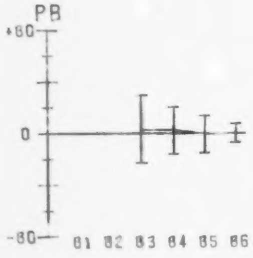
REG : 03
STATE : 39 PENNSYLVANIA
REPORG: 001 PENNSYLVANIA DER

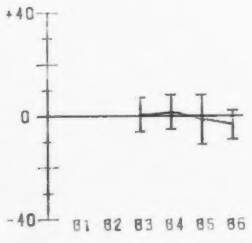
PRECISION

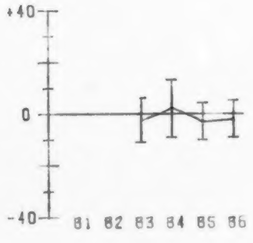
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





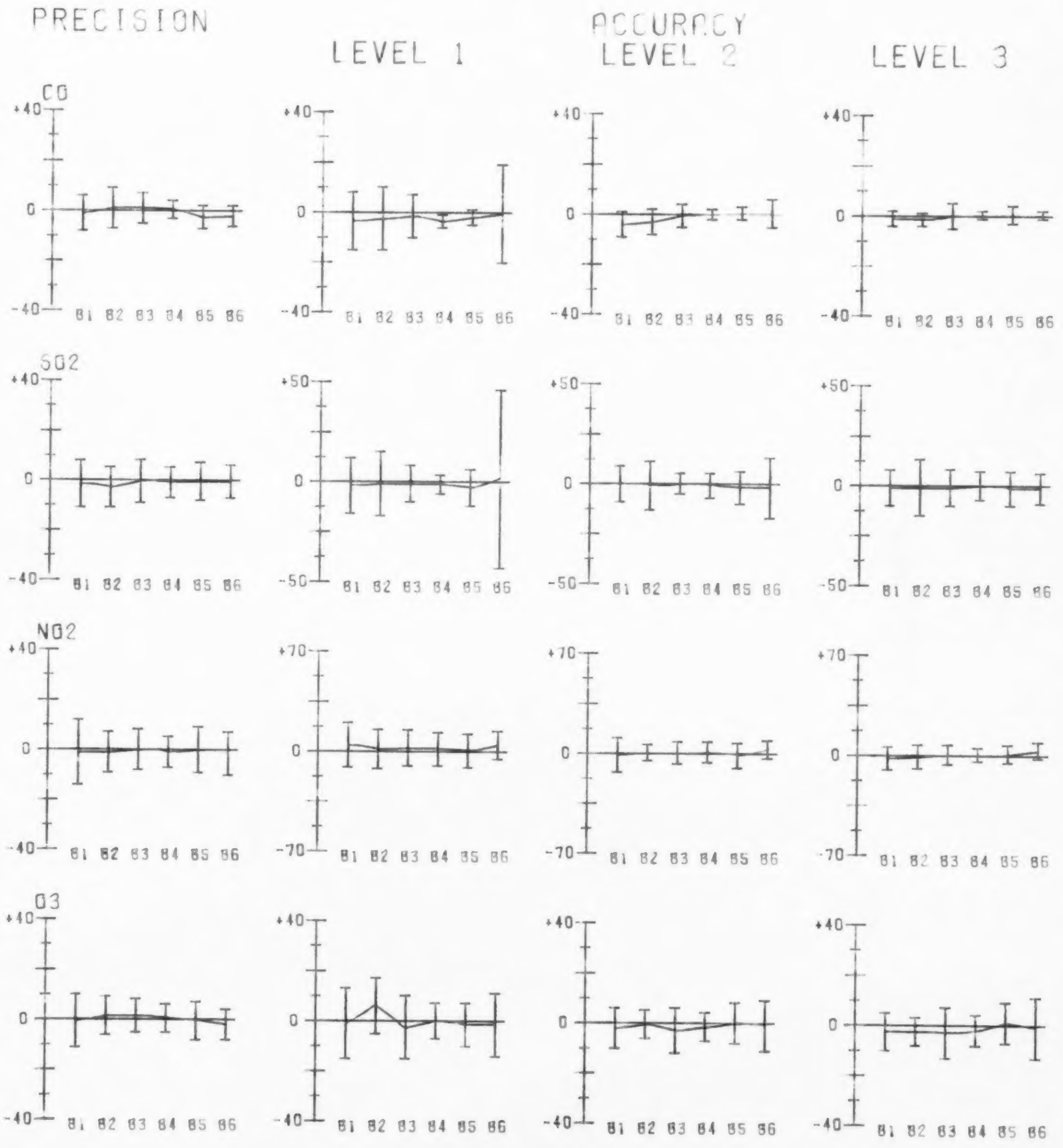






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 39 PENNSYLVANIA
REPORG: 002 ALLEGHENY CO. BAPC

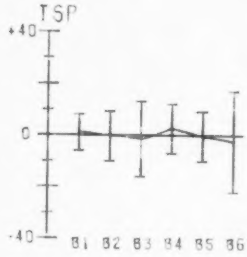


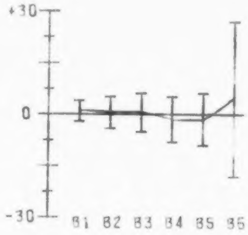
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

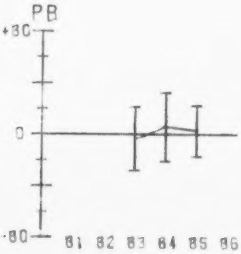
REG : 03
STATE : 39 PENNSYLVANIA
REPORG: 002 ALLEGHENY CO. BAPC

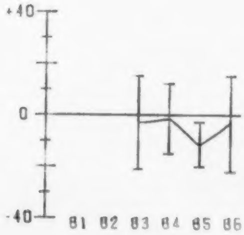
PRECISION

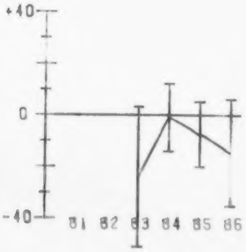
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





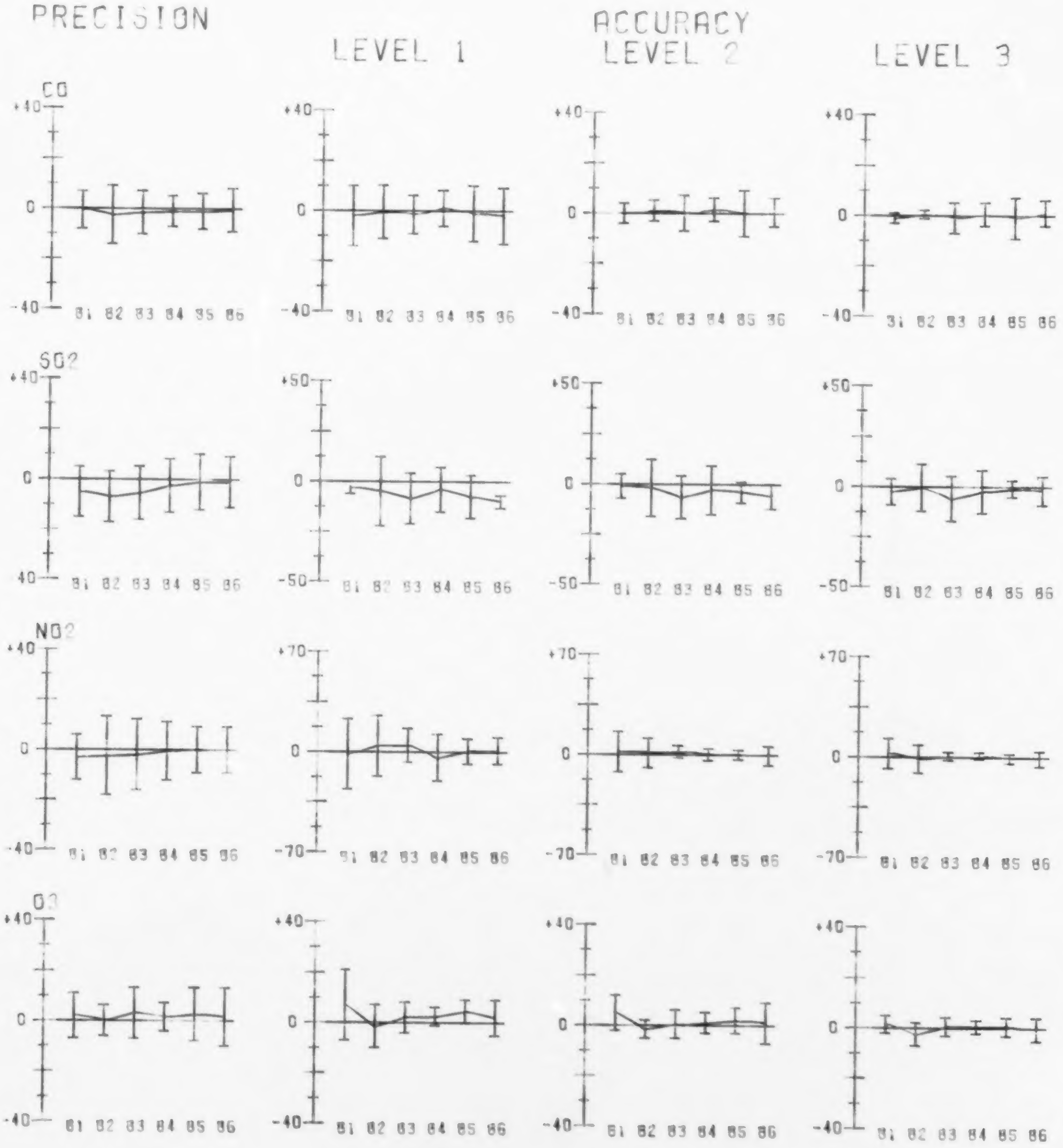






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 30 PENNSYLVANIA
REPORG: 003 PHILADELPHIA AMS

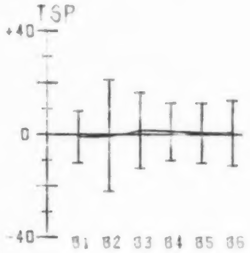


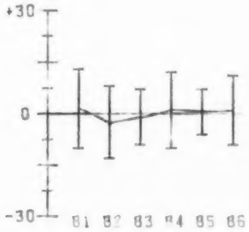
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

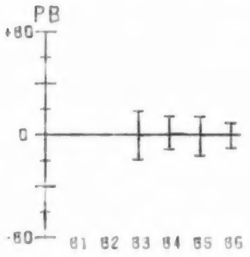
REG   : 03
STATE : 39 PENNSYLVANIA
REPORG : 003 PHILADELPHIA AMS

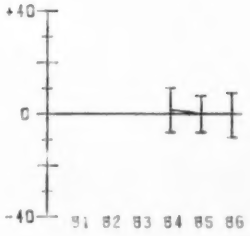
PRECISION — ACCURACY

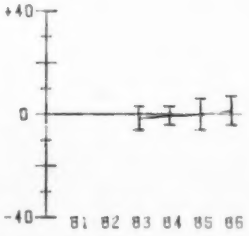
LEVEL 1 — LEVEL 2 — LEVEL 3





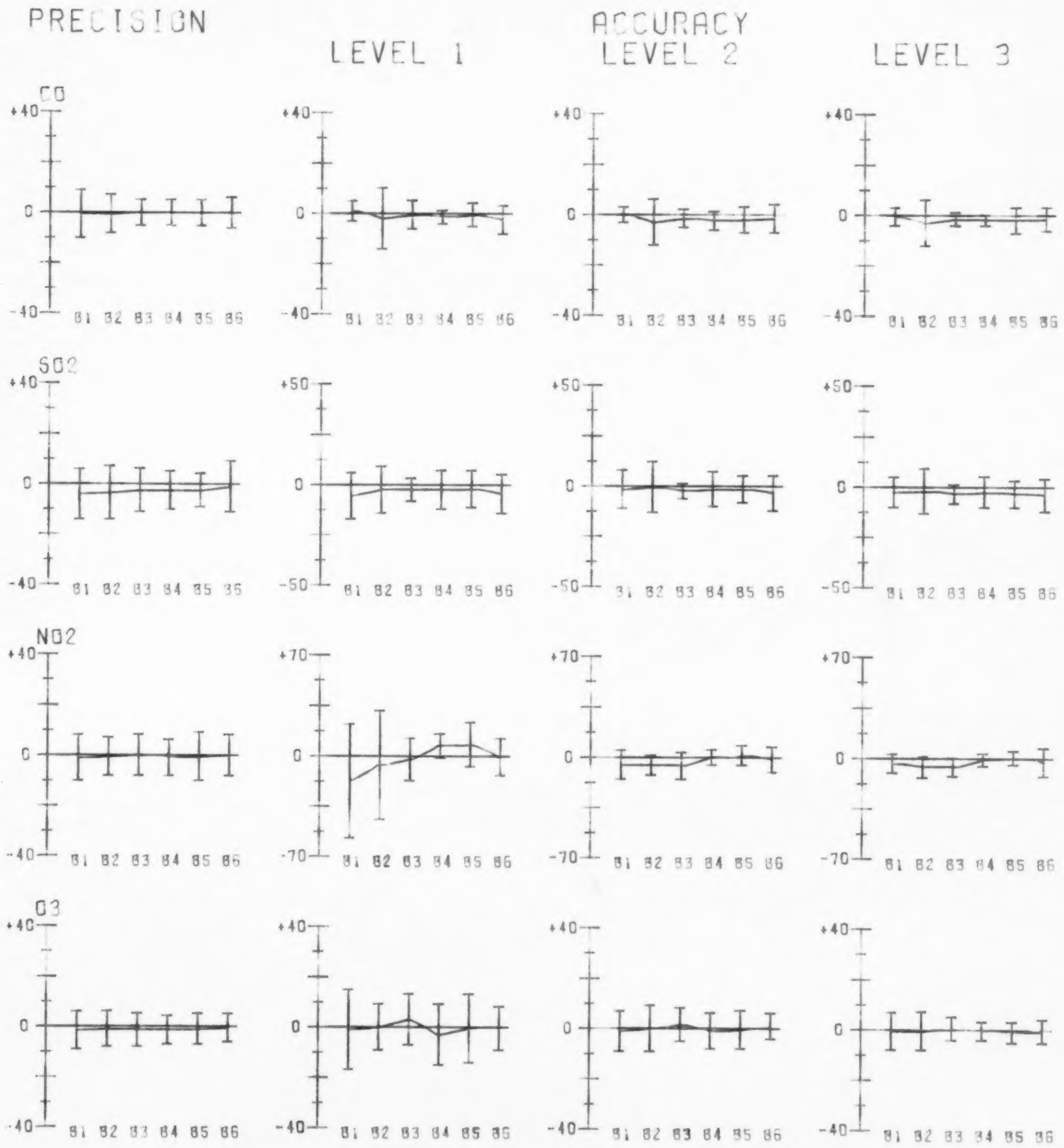






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 03
STATE : 48   VIRGINIA
REPORG: 001 VIRGINIA STATE AIR POLL. CONTROL BOARD



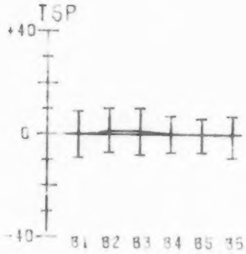
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

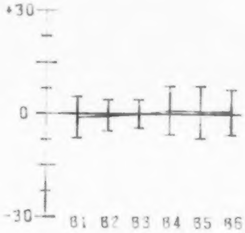
REG : 03
STATE : 48 VIRGINIA
REPORG: 001 VIRGINIA STATE AIR POLL. CONTROL BOARD

PRECISION

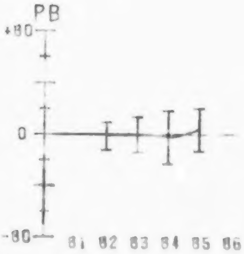
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

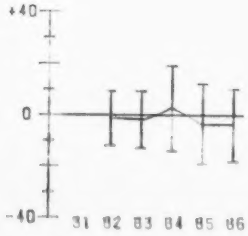
TSP

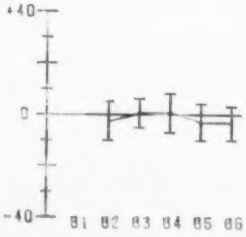




PB

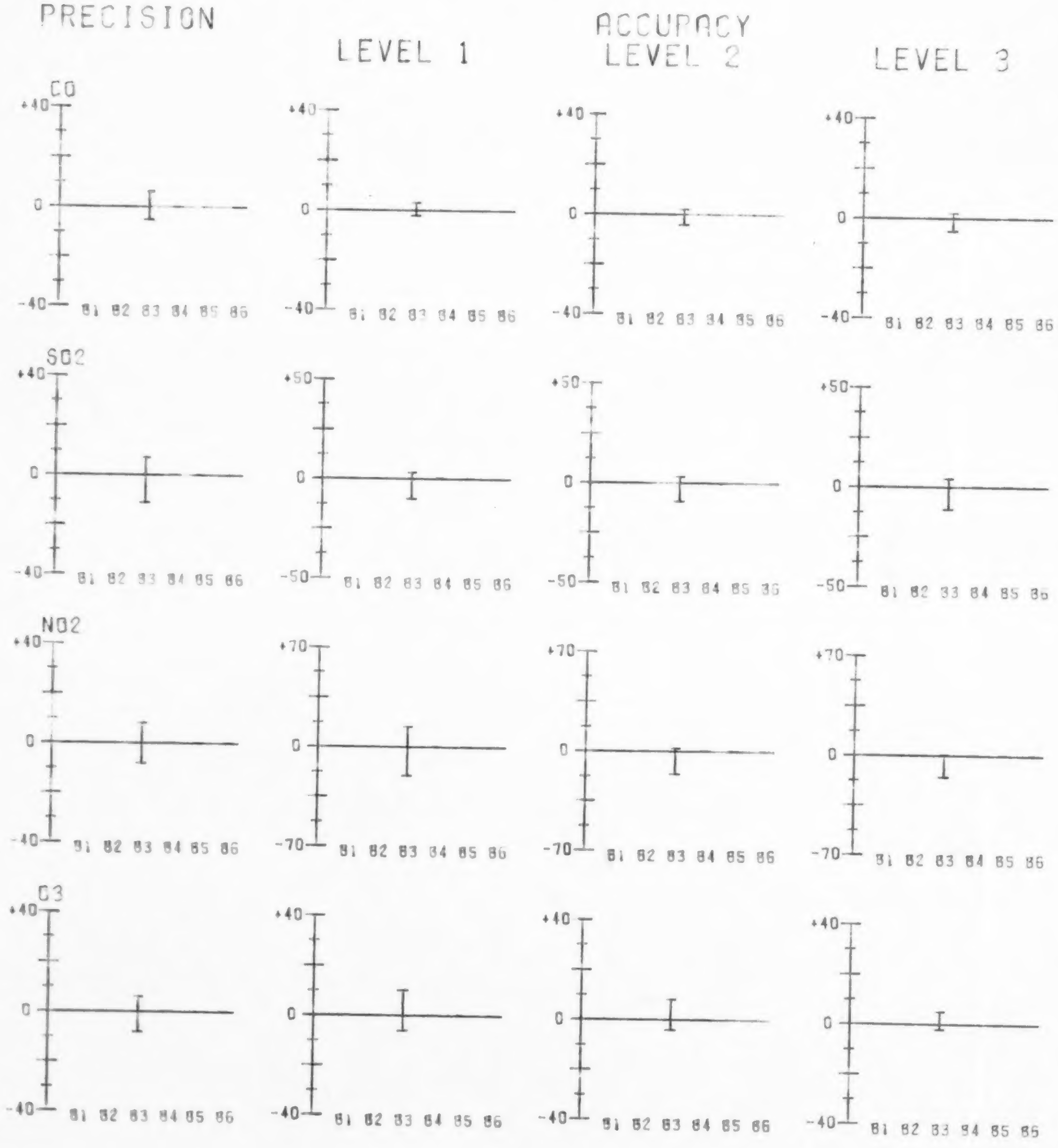






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

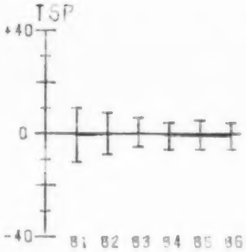
REG : 03
STATE : 48 VIRGINIA
REPORG: 002 CITY OF ALEXANDRIA

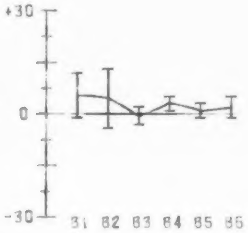


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 03
STATE : 48 VIRGINIA
REPORG: 002 CITY OF ALEXANDRIA

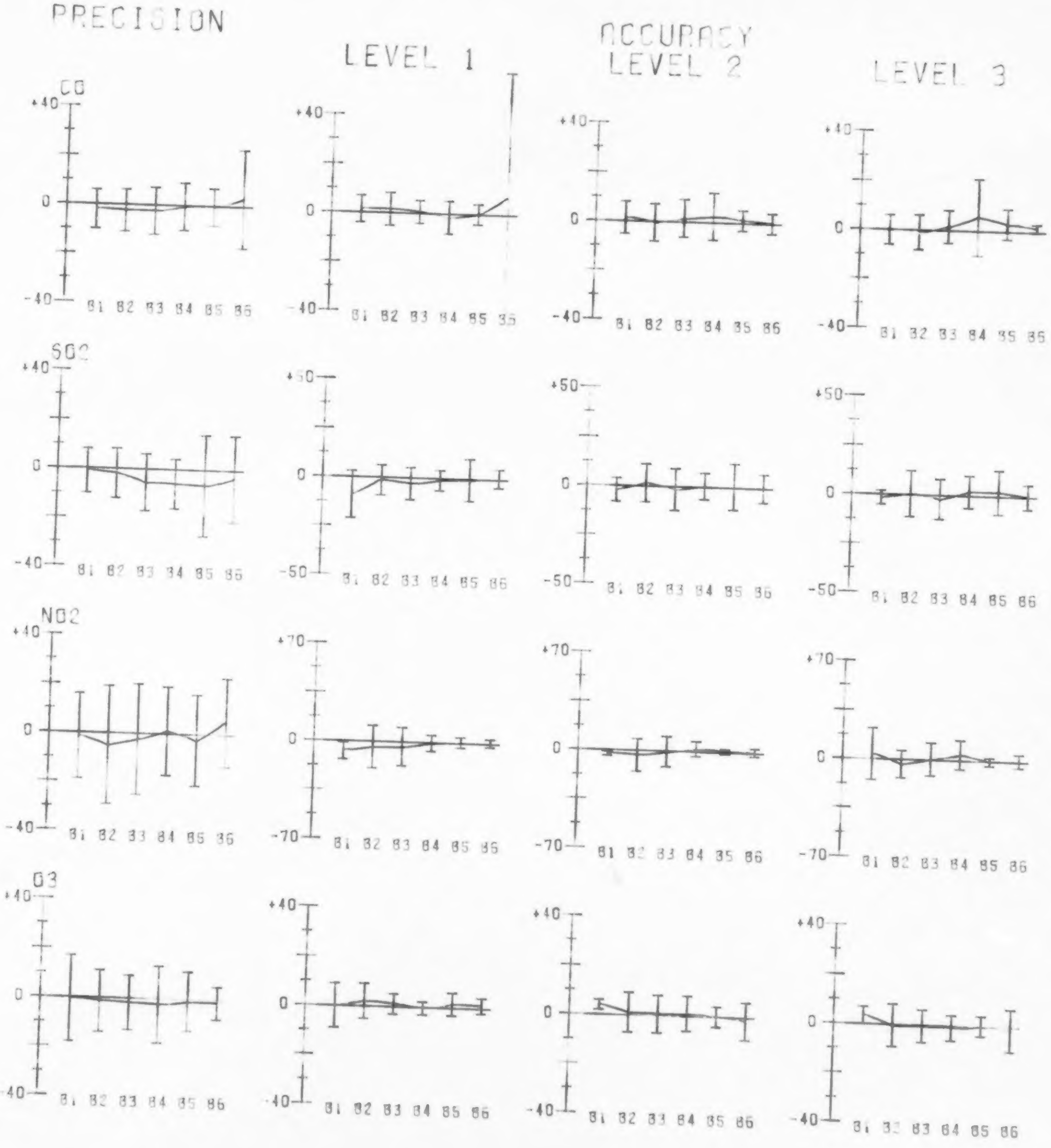
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

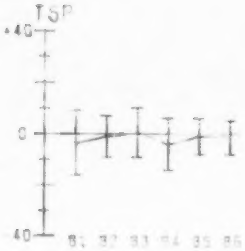
REG : 03
STATE : 48 VIRGINIA
REPORG: 003 FAIRFAX COUNTY

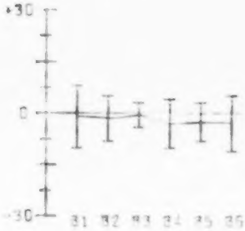


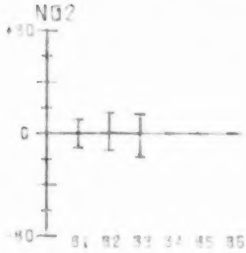
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

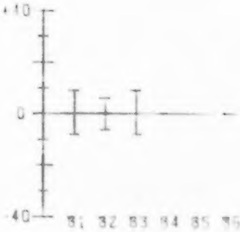
REG : 03
STATE : 48 VIRGINIA
REPORG: 003 FAIRFAX COUNTY

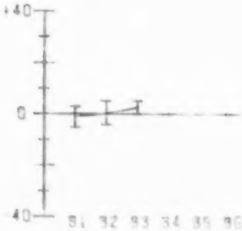
PRECISION | LEVEL 1 | ACCURACY LEVEL 2 | LEVEL 3

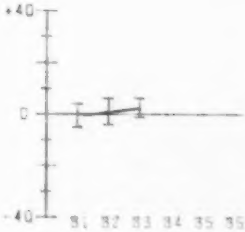


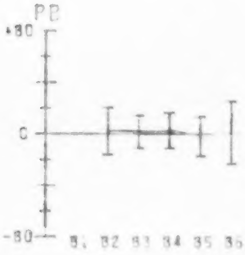


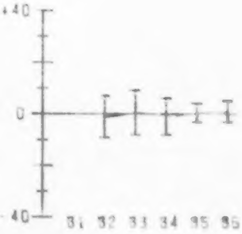


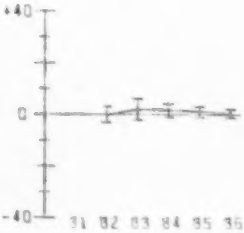












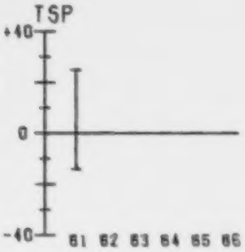
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

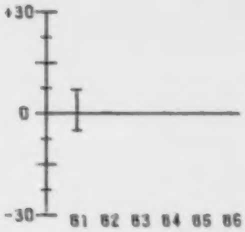
REG   : 03
STATE : 48 VIRGINIA
REPORG : 004 ROANOKE COUNTY

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



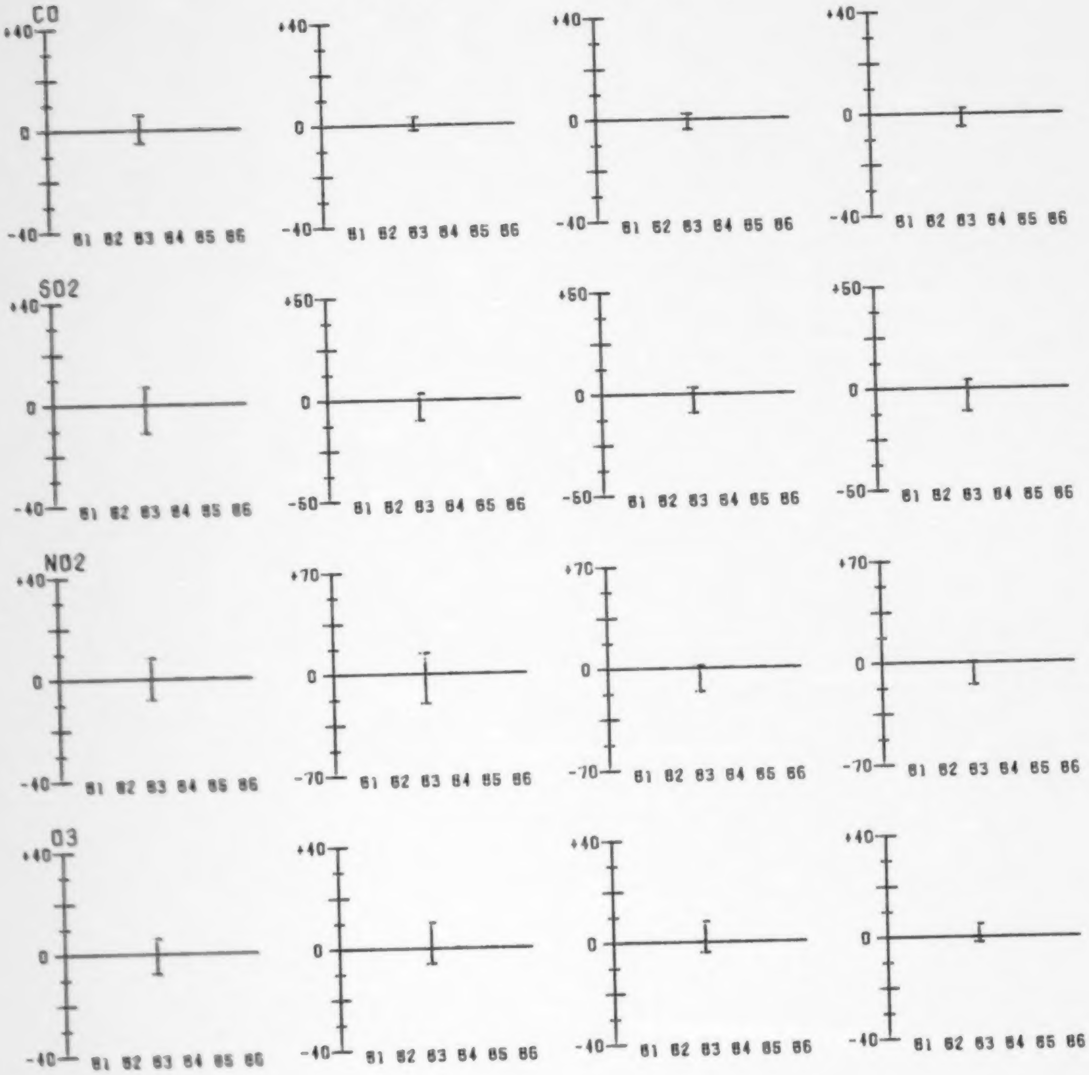


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 48 VIRGINIA
REPORG: 005 TENNESSEE VALLEY AUTHORITY - VIRGINIA

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



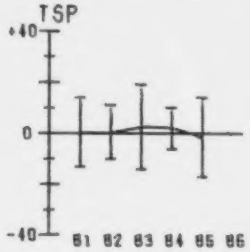
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

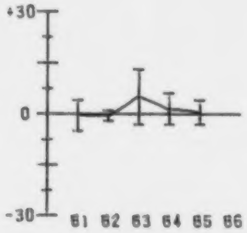
REG : 03
STATE : 48 VIRGINIA
REPORG: 005 TENNESSEE VALLEY AUTHORITY - VIRGINIA

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



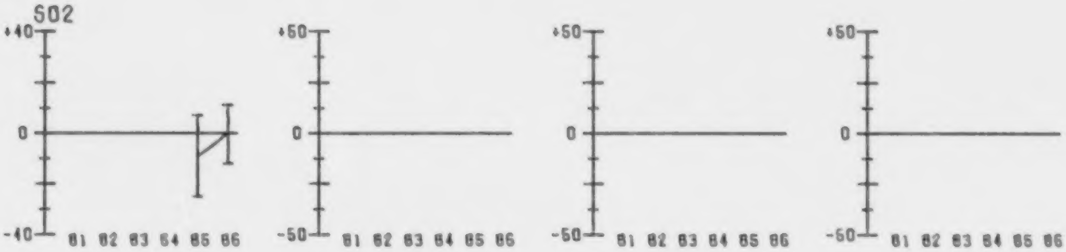


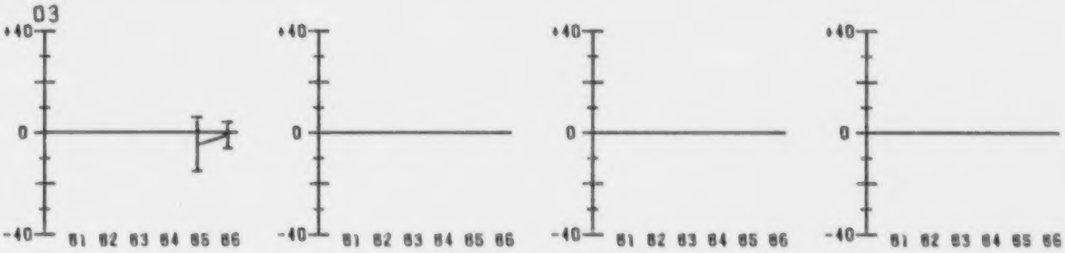
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 48 VIRGINIA
REPORG: 006 TVA-VA (SAME AS 005)

PRECISION

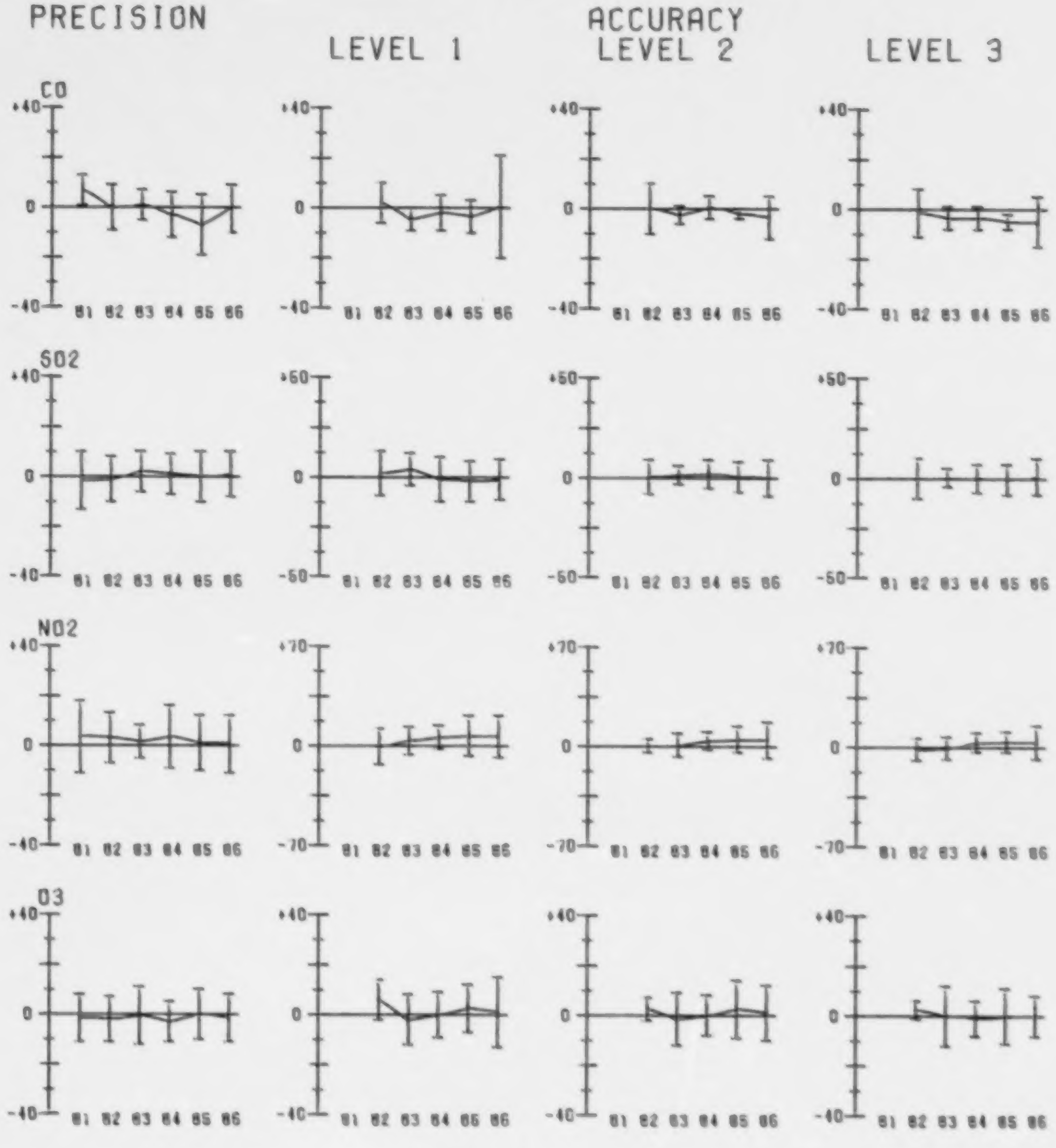
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03
STATE : 50 WEST VIRGINIA
REPORG: 001 STATE OF WEST VIRGINIA



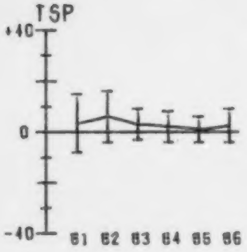
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

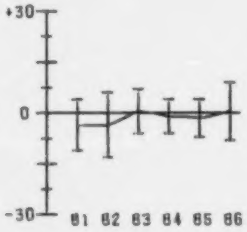
REG : 03
STATE : 50 WEST VIRGINIA
REPORG: 001 STATE OF WEST VIRGINIA

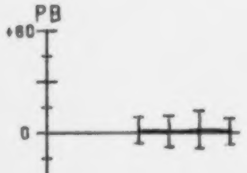
PRECISION

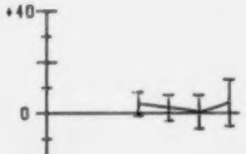
ACCURACY

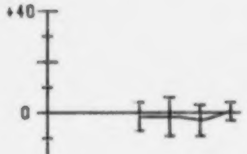
LEVEL 1 LEVEL 2 LEVEL 3





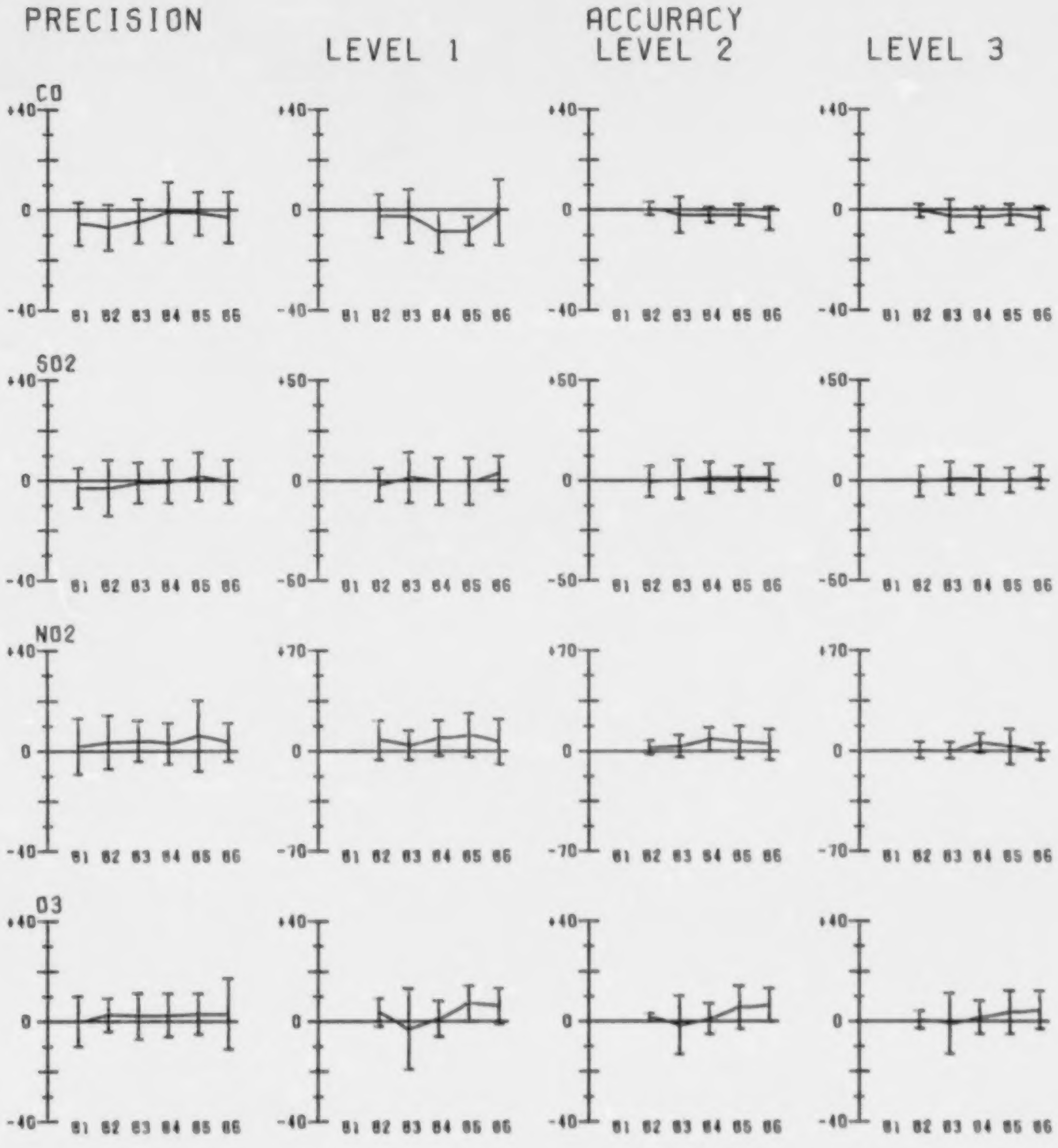






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

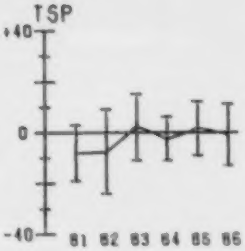
REG   : 03
STATE : 50 WEST VIRGINIA
REPORG : 002 WVA NORTHERN PANHANDLE REGIONAL OFFICE



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

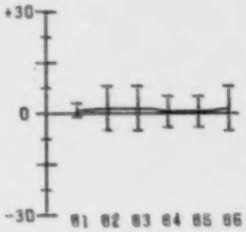
REG   : 03
STATE : 50 WEST VIRGINIA
REPORG: 002 WVA NORTHERN PANHANDLE REGIONAL OFFICE

PRECISION



LEVEL 1

ACCURACY
LEVEL 2

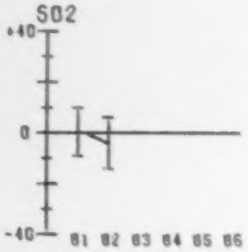


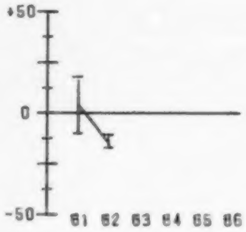
LEVEL 3

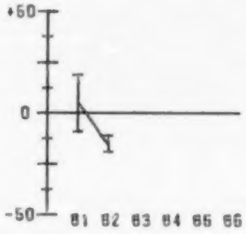
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

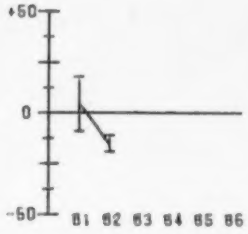
REG   : 04
STATE : 01 ALABAMA
REPORG: 011 ALABAMA DEPT OF ENVIRONMENTAL MANAGEMENT

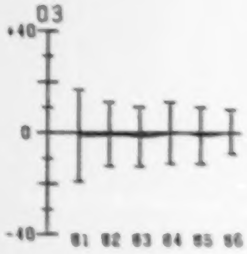
PRECISION	ACCURACY LEVEL 1	ACCURACY LEVEL 2	ACCURACY LEVEL 3

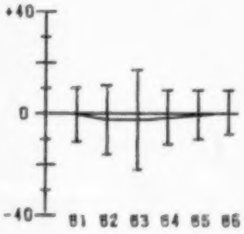


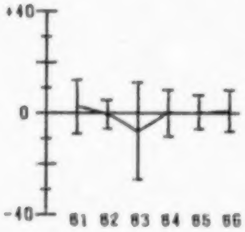


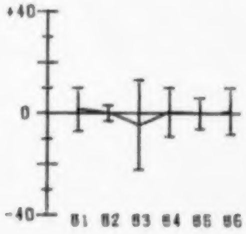








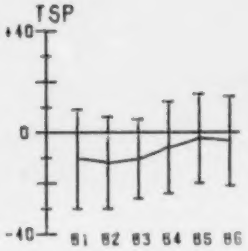


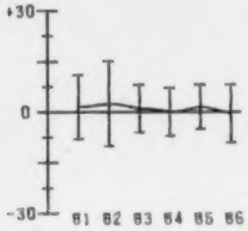


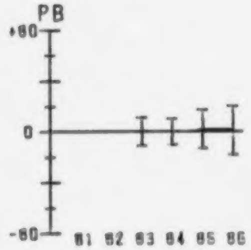
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

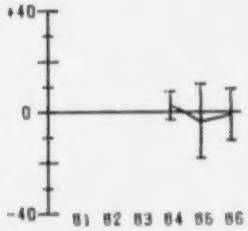
REG   : 04
STATE : 01 ALABAMA
REPORG : 011 ALABAMA DEPT OF ENVIRONMENTAL MANAGEMENT

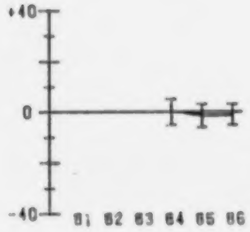
PRECISION　　　　ACCURACY
　　　　LEVEL 1　　LEVEL 2　　LEVEL 3







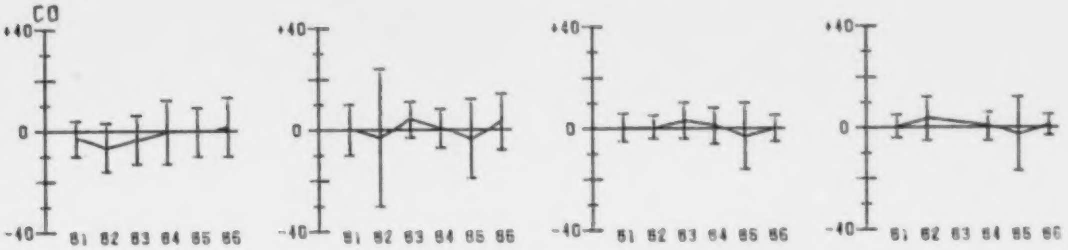


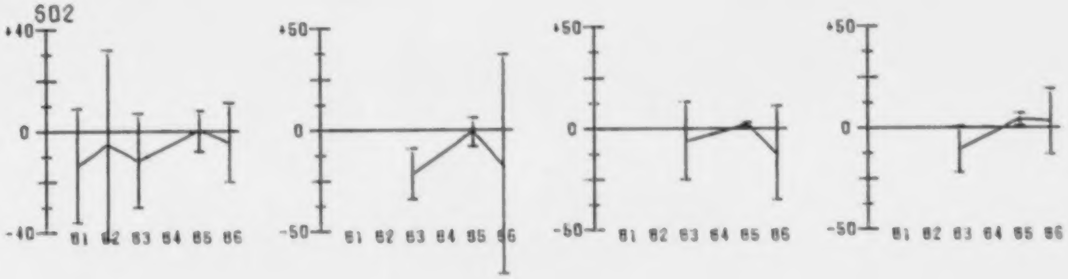


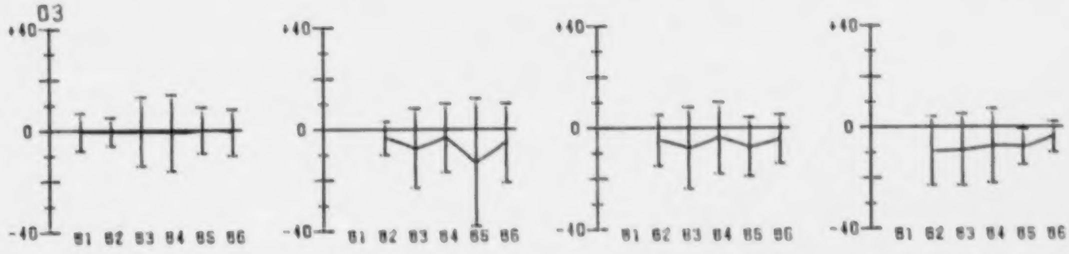
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 01 ALABAMA
REPORG: 012 AL, JEFFERSON CNTY BUREAU OF ENV. HEALTH

PRECISION | ACCURACY LEVEL 1 | LEVEL 2 | LEVEL 3



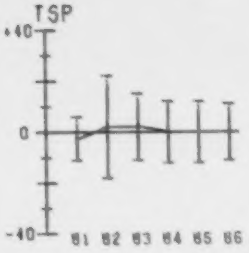


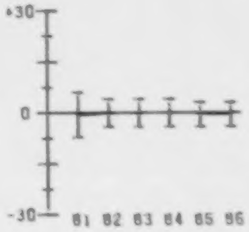


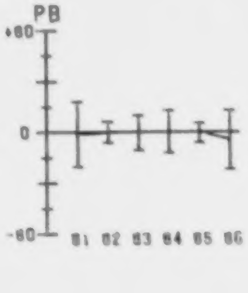
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

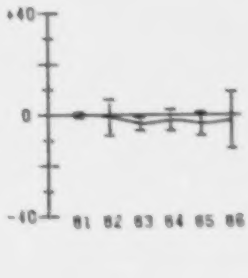
REG   : 04
STATE : 01 ALABAMA
REPORG: 012 AL, JEFFERSON CNTY BUREAU OF ENV. HEALTH

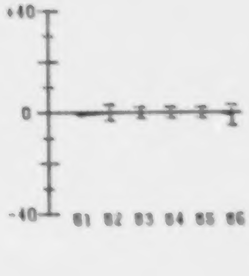
PRECISION   LEVEL 1   ACCURACY LEVEL 2   LEVEL 3









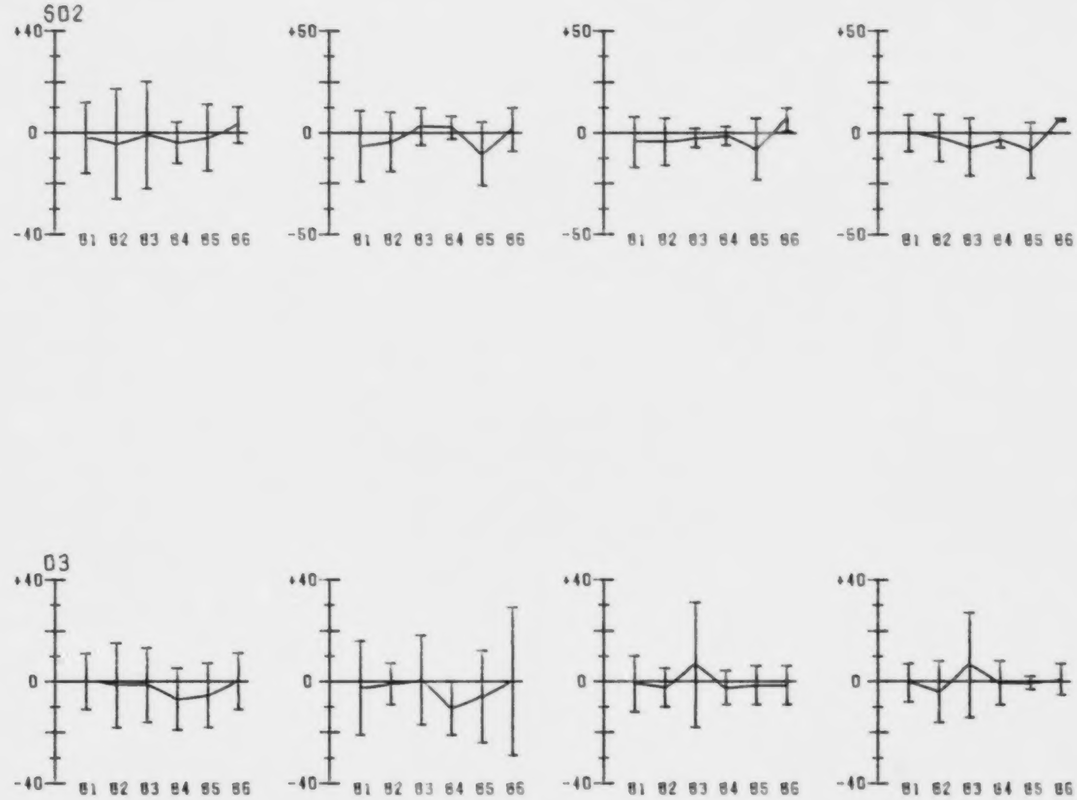


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 01 ALABAMA
REPORG: 013 ALABAMA DEPT. OF ENV. MANAGEMENT MOBILE

PRECISION

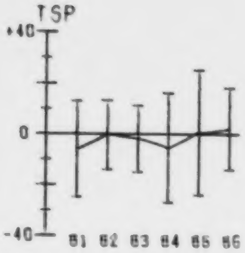
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3

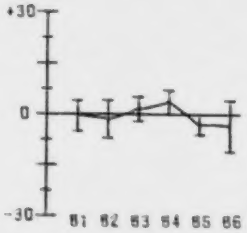


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 01 ALABAMA
REPORG: 013 ALABAMA DEPT. OF ENV. MANAGEMENT MOBILE

PRECISION
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3

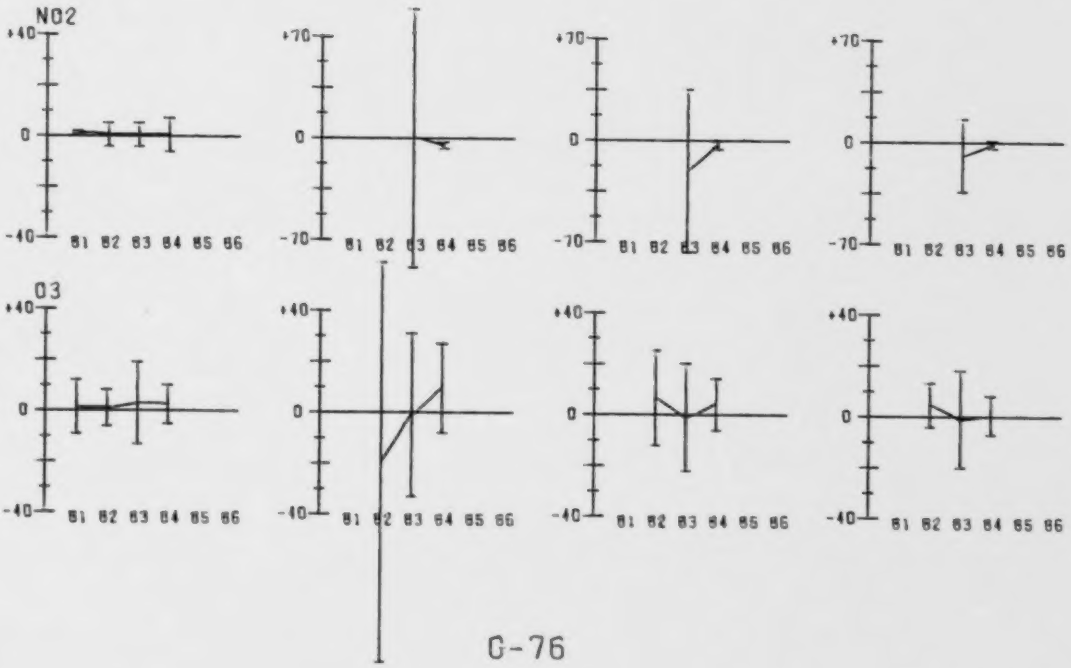




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 01 ALABAMA
REPORG : 014 AL, HUNTSVILLE AIR POLL. CONTROL DEPT.

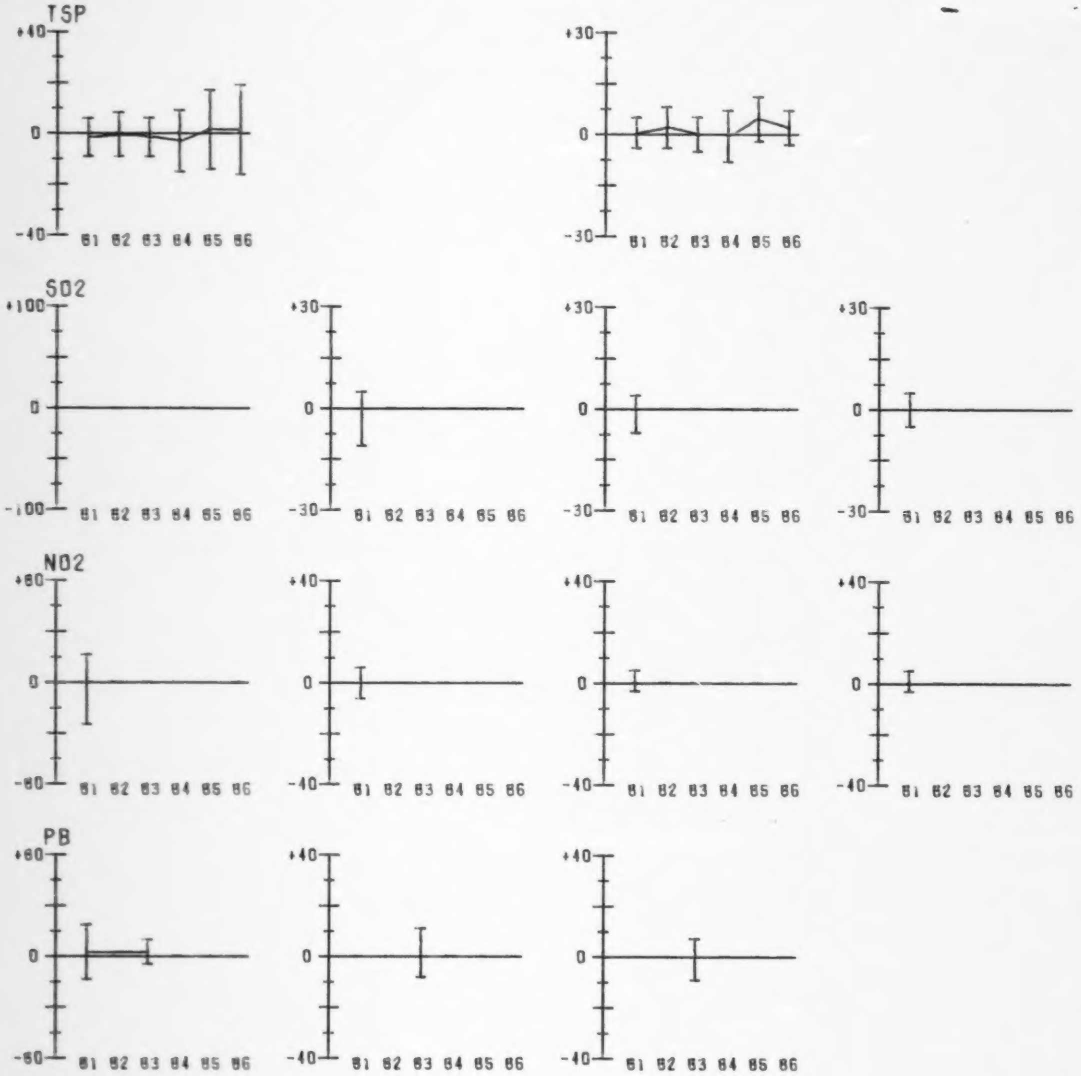
PRECISION | ACCURACY LEVEL 1 | ACCURACY LEVEL 2 | ACCURACY LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 01 ALABAMA
REPORG: 014 AL, HUNTSVILLE AIR POLL. CONTROL DEPT.

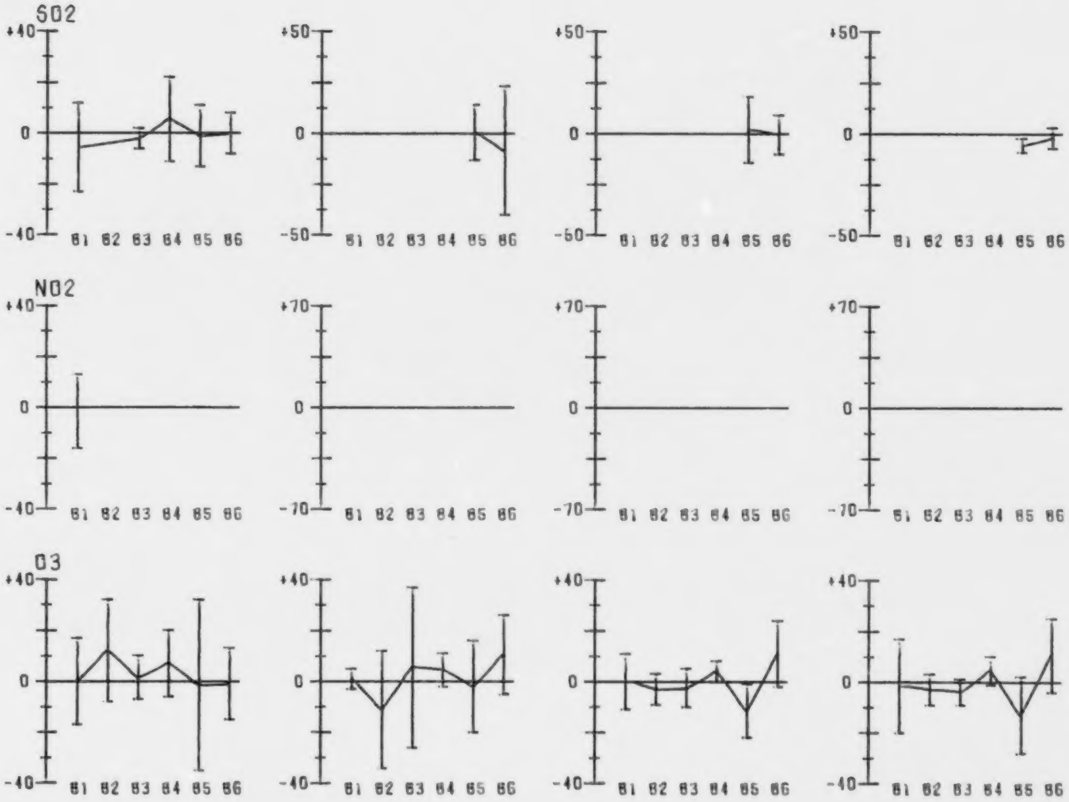
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 01 ALABAMA
REPORG: 015 AL, TRICOUNTY DIV. OF AIR POLL. CONTROL

PRECISION
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

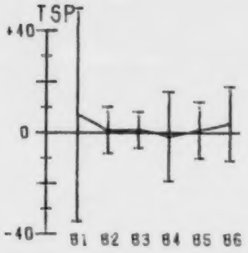


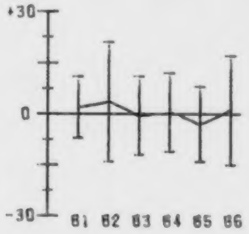
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 01 ALABAMA
REPORG : 015 AL, TRICOUNTY DIV. OF AIR POLL. CONTROL

PRECISION

ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





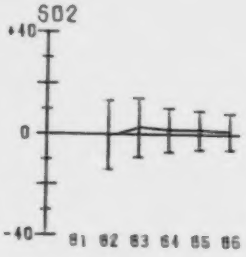
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

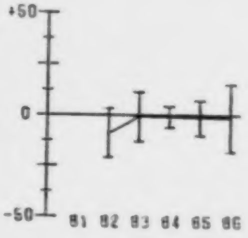
REG : 04
STATE : 01 ALABAMA
REPORG: 016 TENNESSEE VALLEY AUTHORITY - ALABAMA

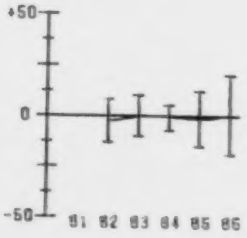
PRECISION

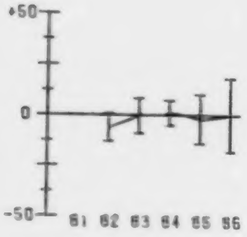
ACCURACY

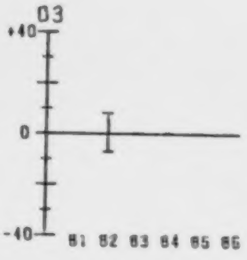
LEVEL 1 LEVEL 2 LEVEL 3

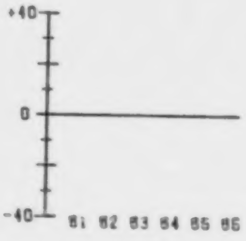


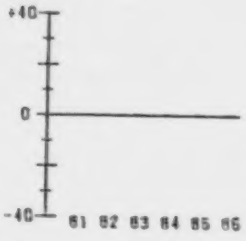


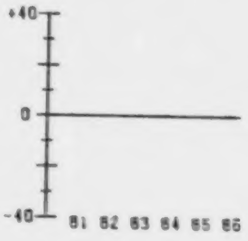












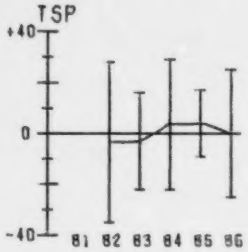
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

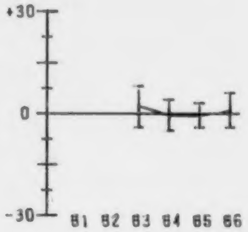
REG   : 04
STATE : 01 ALABAMA
REPORG : 016 TENNESSEE VALLEY AUTHORITY - ALABAMA

PRECISION

ACCURACY

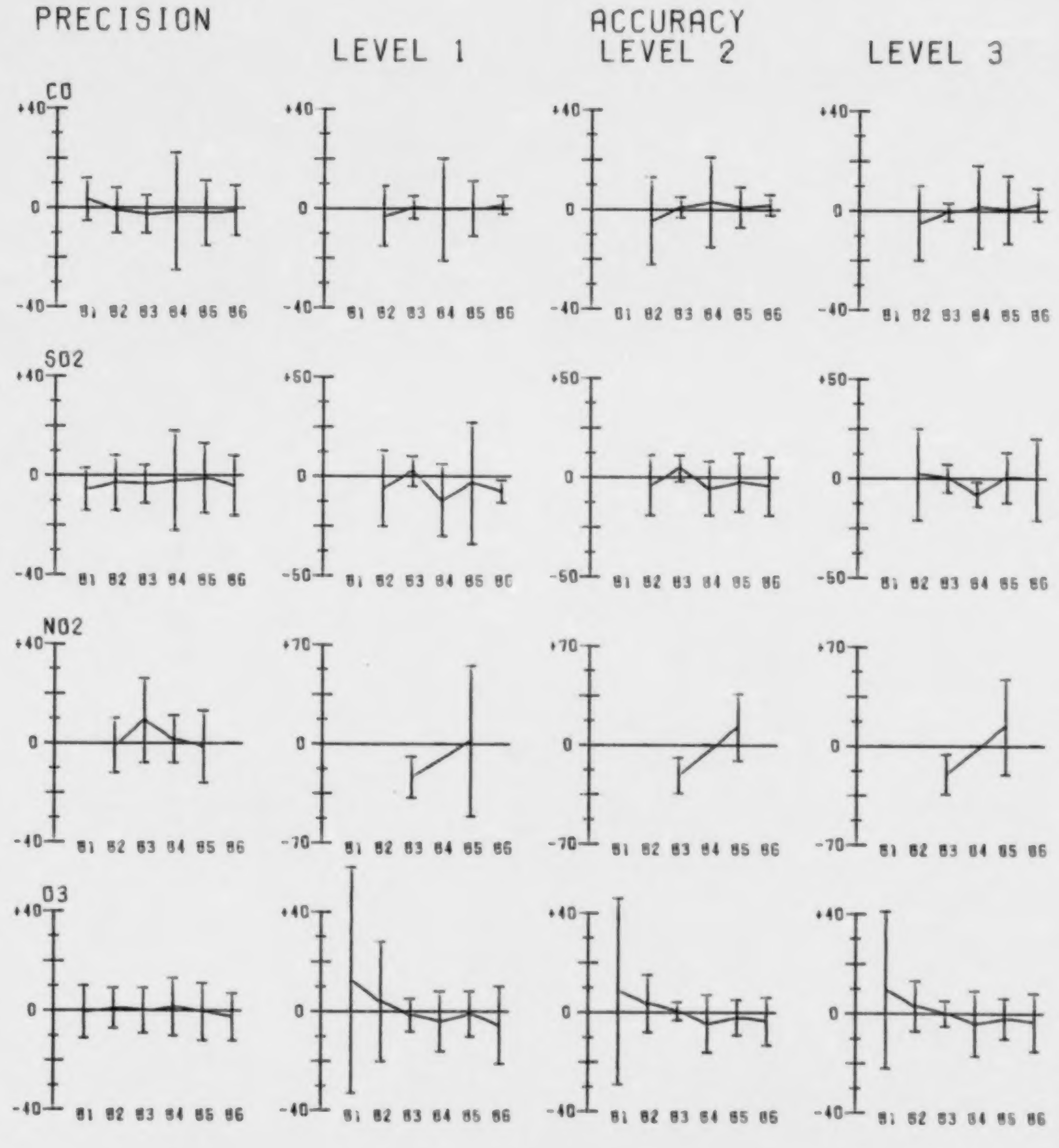
LEVEL 1   LEVEL 2   LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 001 FDER, NORTHWEST DISTRICT



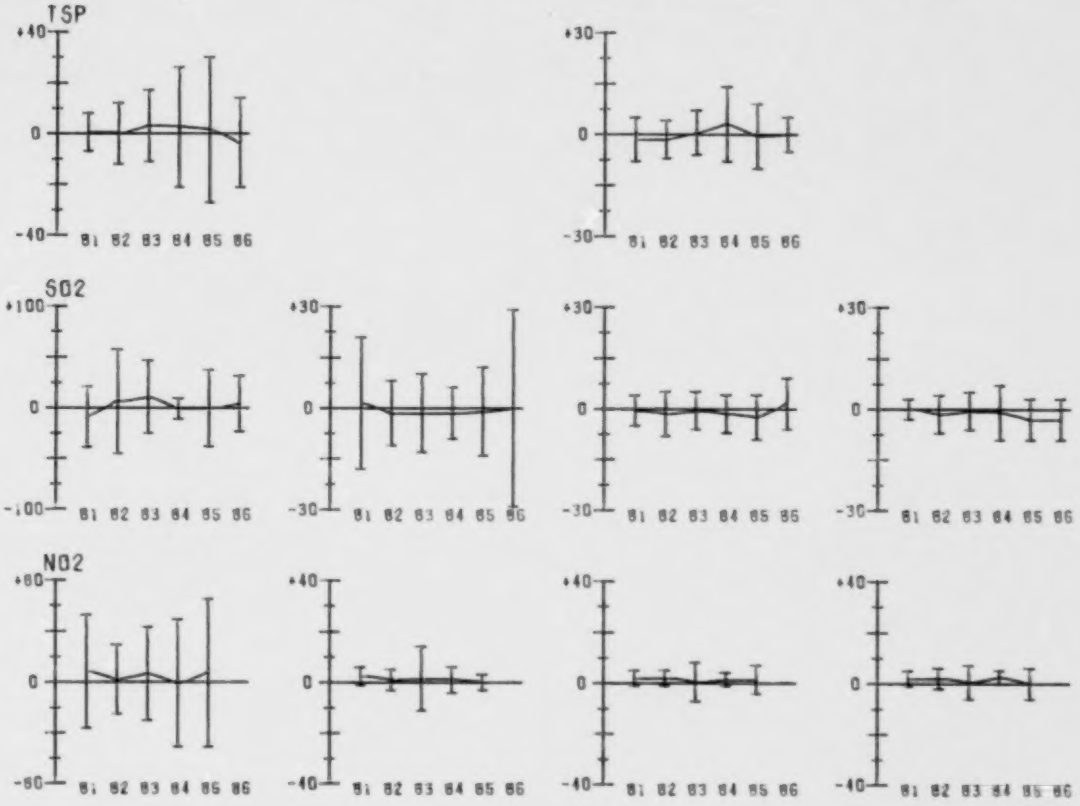
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 10 FLORIDA
REPORG: 001 FDER, NORTHWEST DISTRICT

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3

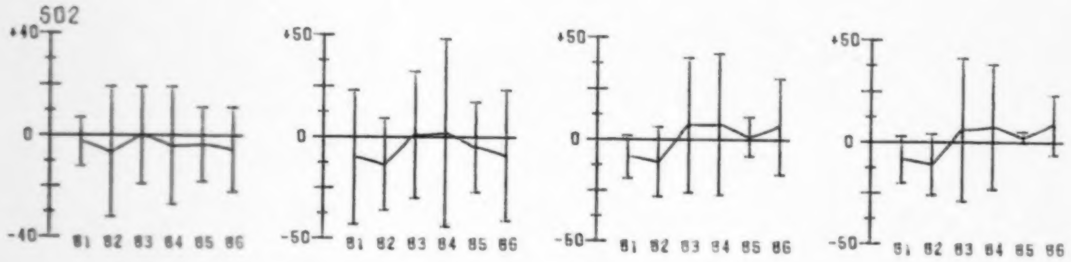


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 002 FDER, NORTHEAST DISTRICT

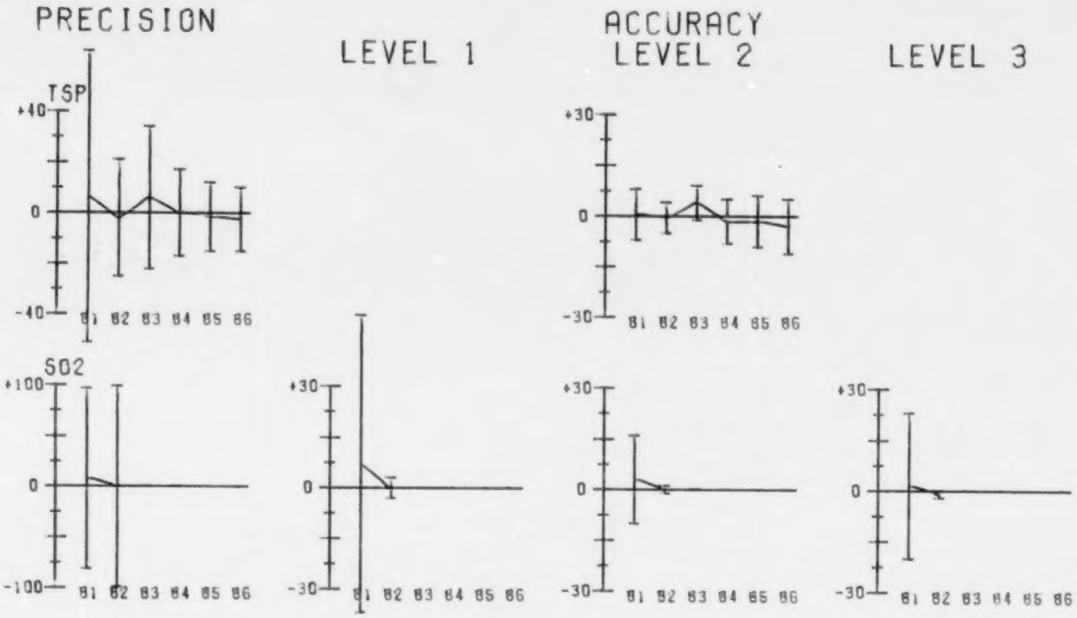
PRECISION

ACCURACY
LEVEL 1 — LEVEL 2 LEVEL 3



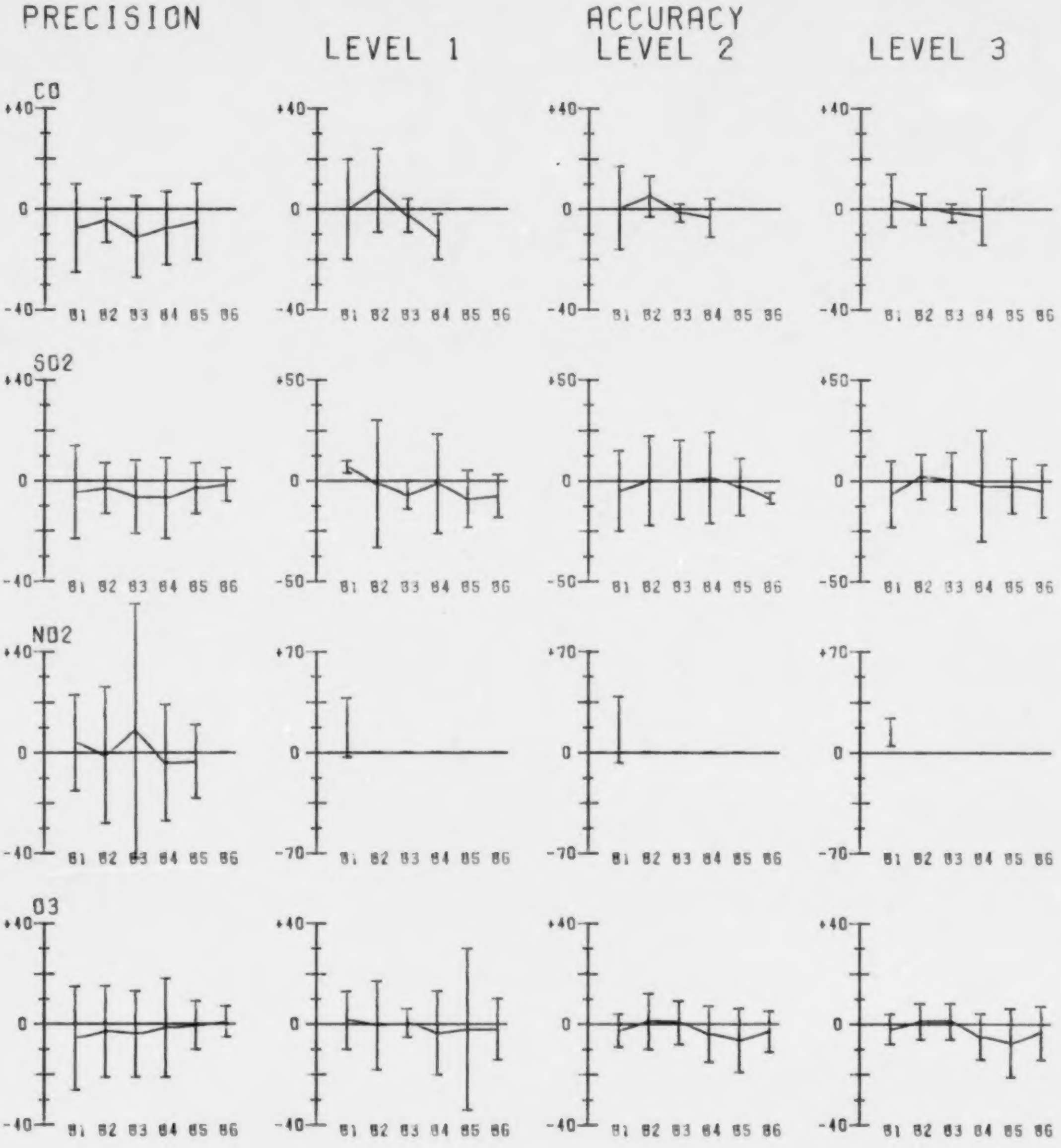
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 002 FDER, NORTHEAST DISTRICT



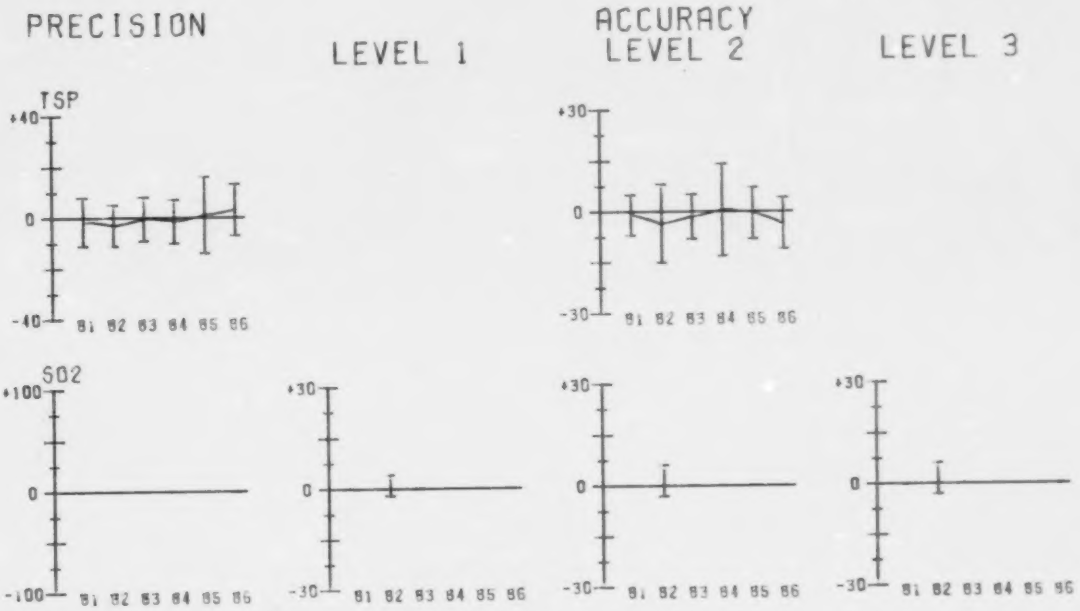
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 003 FDER, ST. JOHNS RIVER DISTRICT



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

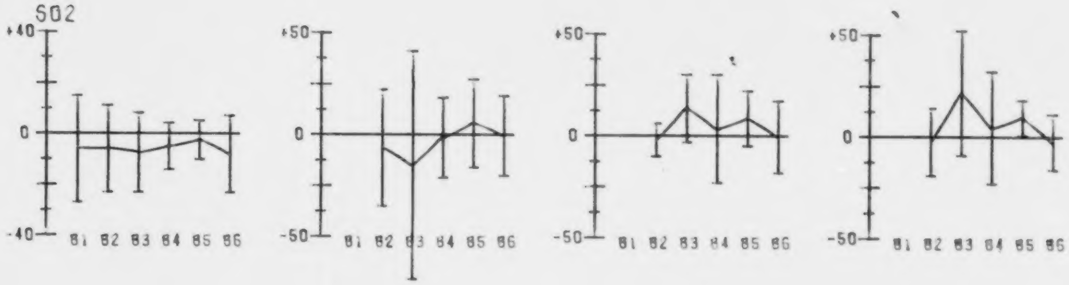
REG : 04
STATE : 10 FLORIDA
REPORG: 003 FDER, ST. JOHNS RIVER DISTRICT



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

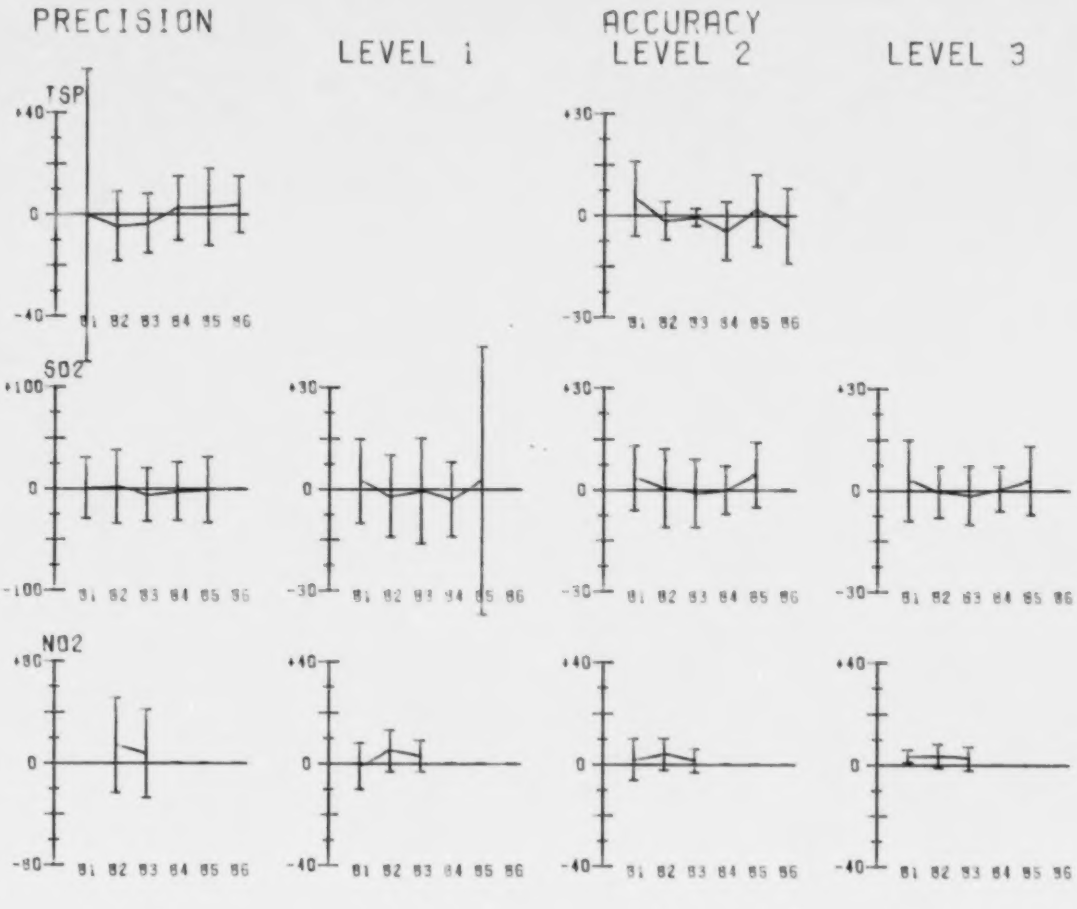
REG : 04
STATE : 10 FLORIDA
REPORG: 004 FDER, SOUTHWEST DISTRICT

PRECISION
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

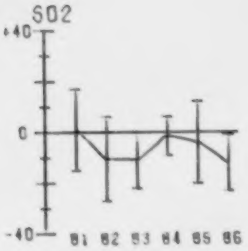
REG   : 04
STATE : 10 FLORIDA
REPORG : 004 FDER, SOUTHWEST DISTRICT

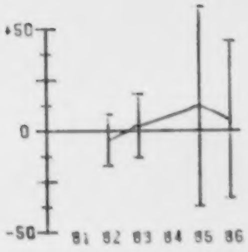


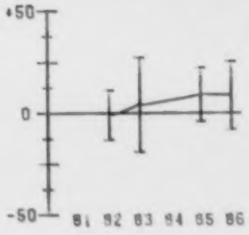
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

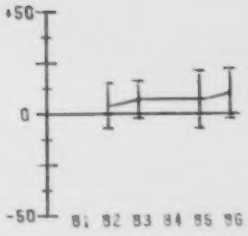
REG   : 04
STATE : 10 FLORIDA
REPORG: 005 FDER, SOUTH FLORIDA DISTRICT

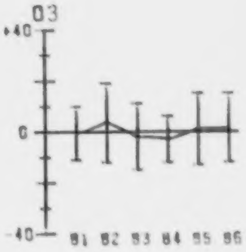
PRECISION — ACCURACY: LEVEL 1, LEVEL 2, LEVEL 3

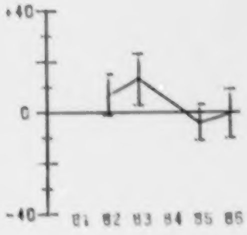


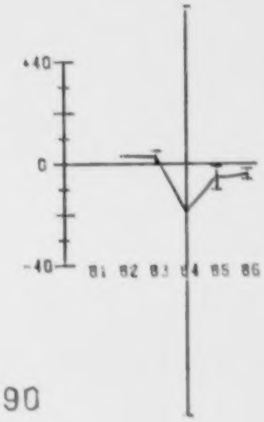


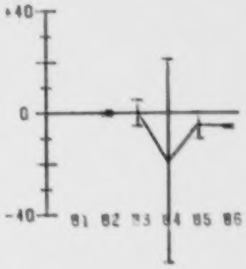






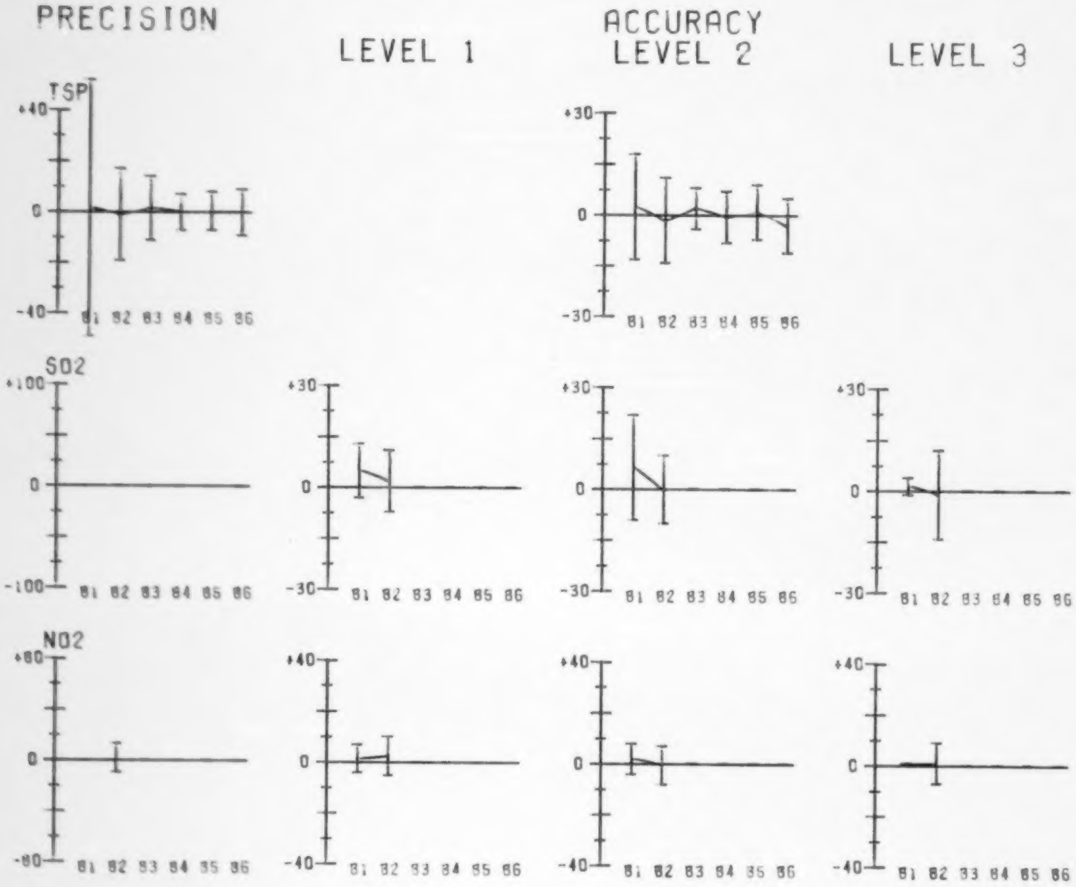






95% PROBABILITY LIMITS 81-86
MANUAL METHODS

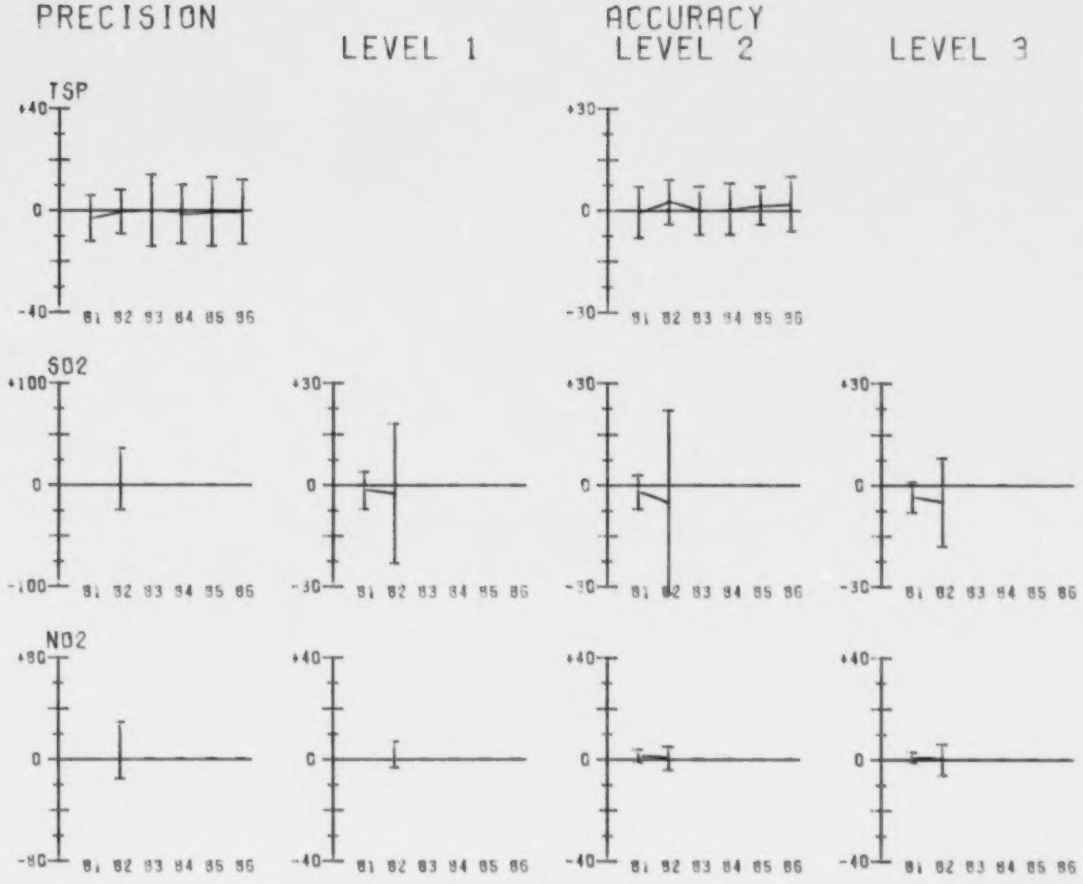
REG   : 04
STATE : 10 FLORIDA
REPORG : 005 FDER, SOUTH FLORIDA DISTRICT



```
                95% PROBABILITY LIMITS 81-86
                     CONTINUOUS METHODS
REG    : 04
STATE  : 10  FLORIDA
REPORG: 006 FDER, SOUTHEAST FLORIDA DISTRICT

 PRECISION                         ACCURACY
                 LEVEL 1           LEVEL 2           LEVEL 3
```

95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 006 FDER, SOUTHEAST FLORIDA DISTRICT

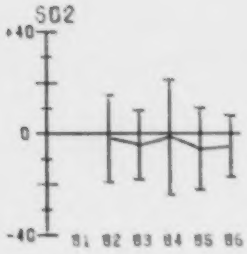


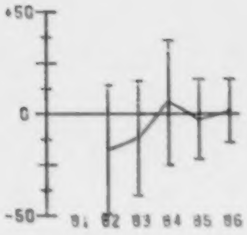
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

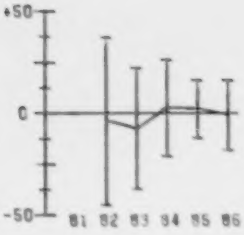
REG   : 04
STATE : 10 FLORIDA
REPORG : 007 FDER, NORTHEAST DISTRICT BRANCH OFFICE

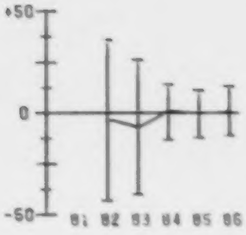
PRECISION | ACCURACY

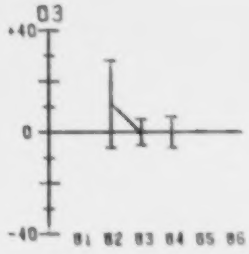
LEVEL 1   LEVEL 2   LEVEL 3

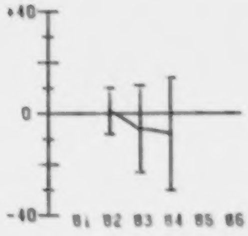


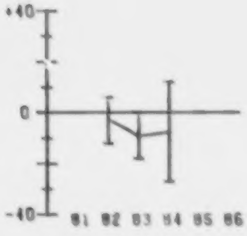


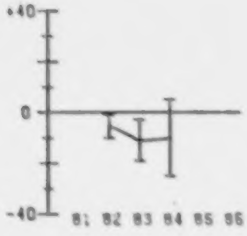












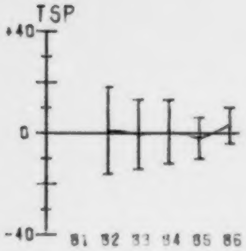
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

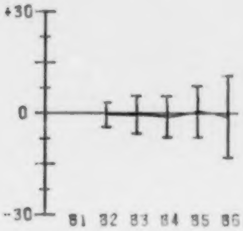
REG   : 04
STATE : 10 FLORIDA
REPORG: 007 FDER, NORTHEAST DISTRICT BRANCH OFFICE

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3





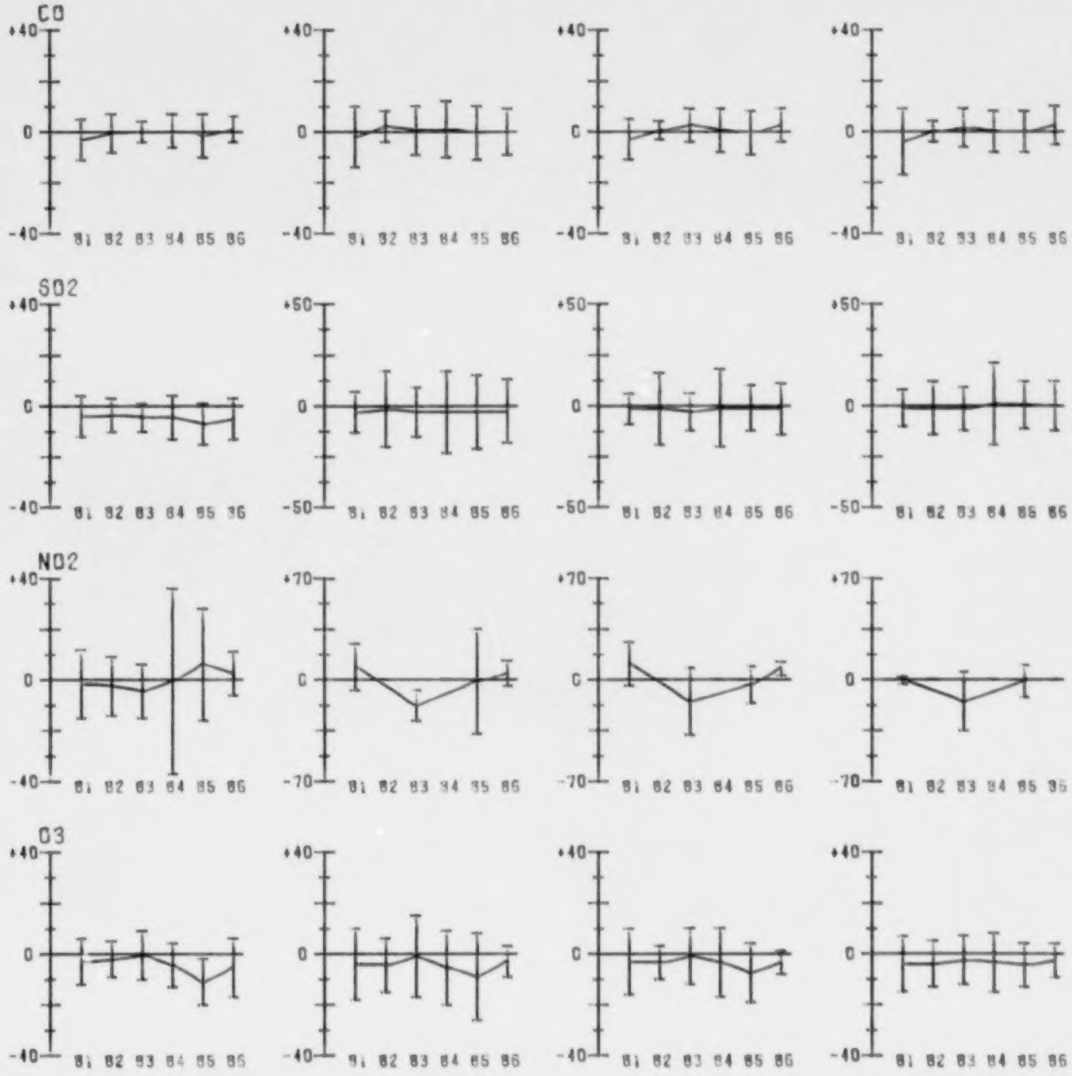
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 011 FL, JACKSONVILLE BIO-ENV. SERVICES DIV.

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



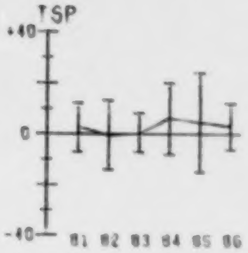
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

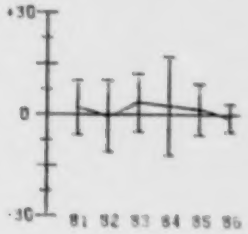
REG : 04
STATE : 10 FLORIDA
REPORG: 011 FL, JACKSONVILLE BIO-ENV. SERVICES DIV.

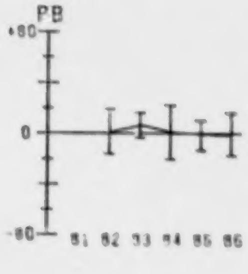
PRECISION

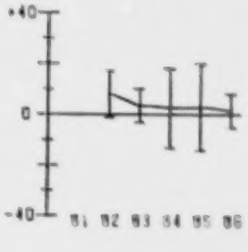
ACCURACY

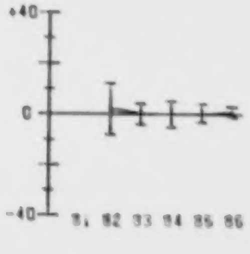
LEVEL 1 LEVEL 2 LEVEL 3





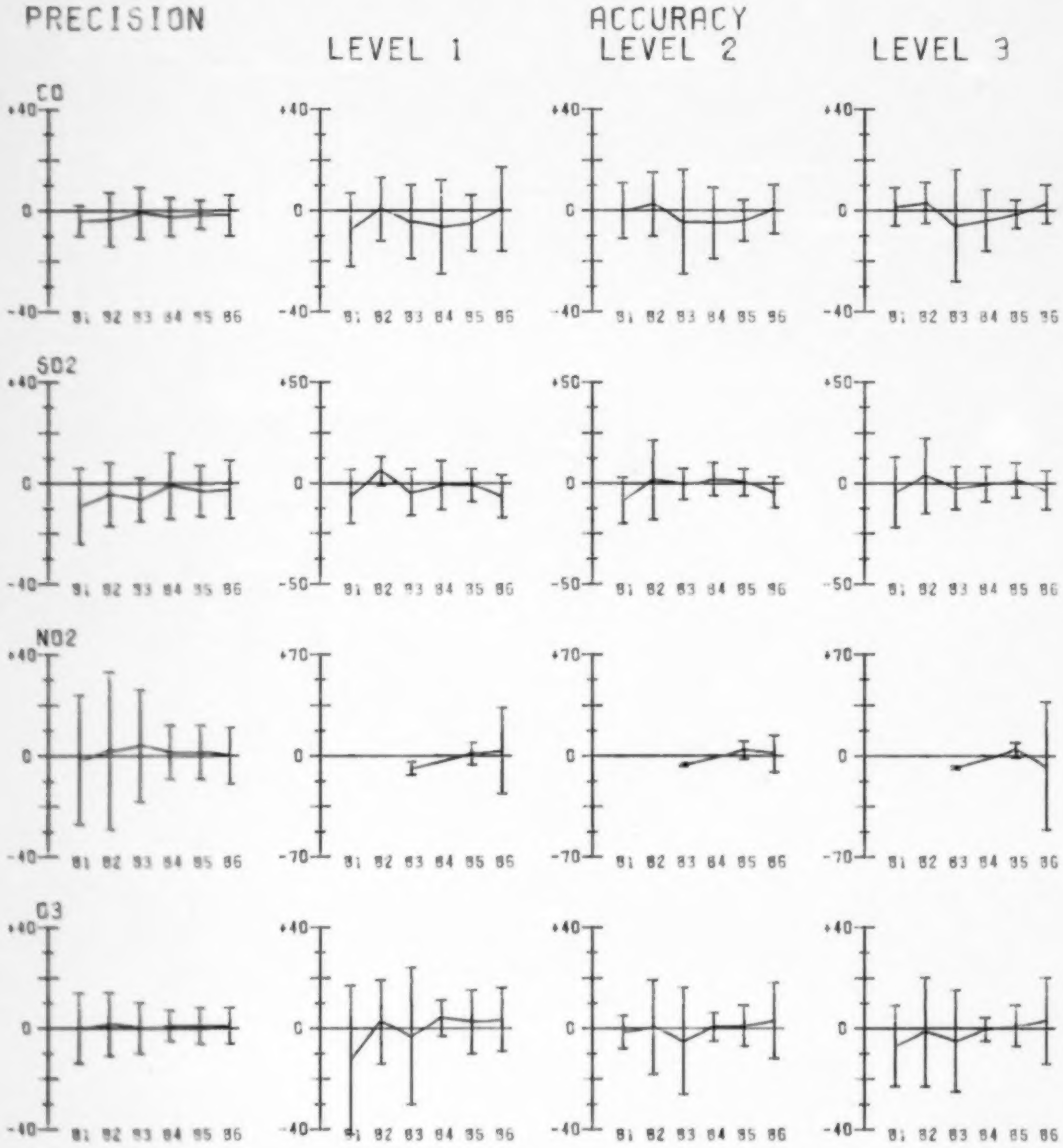






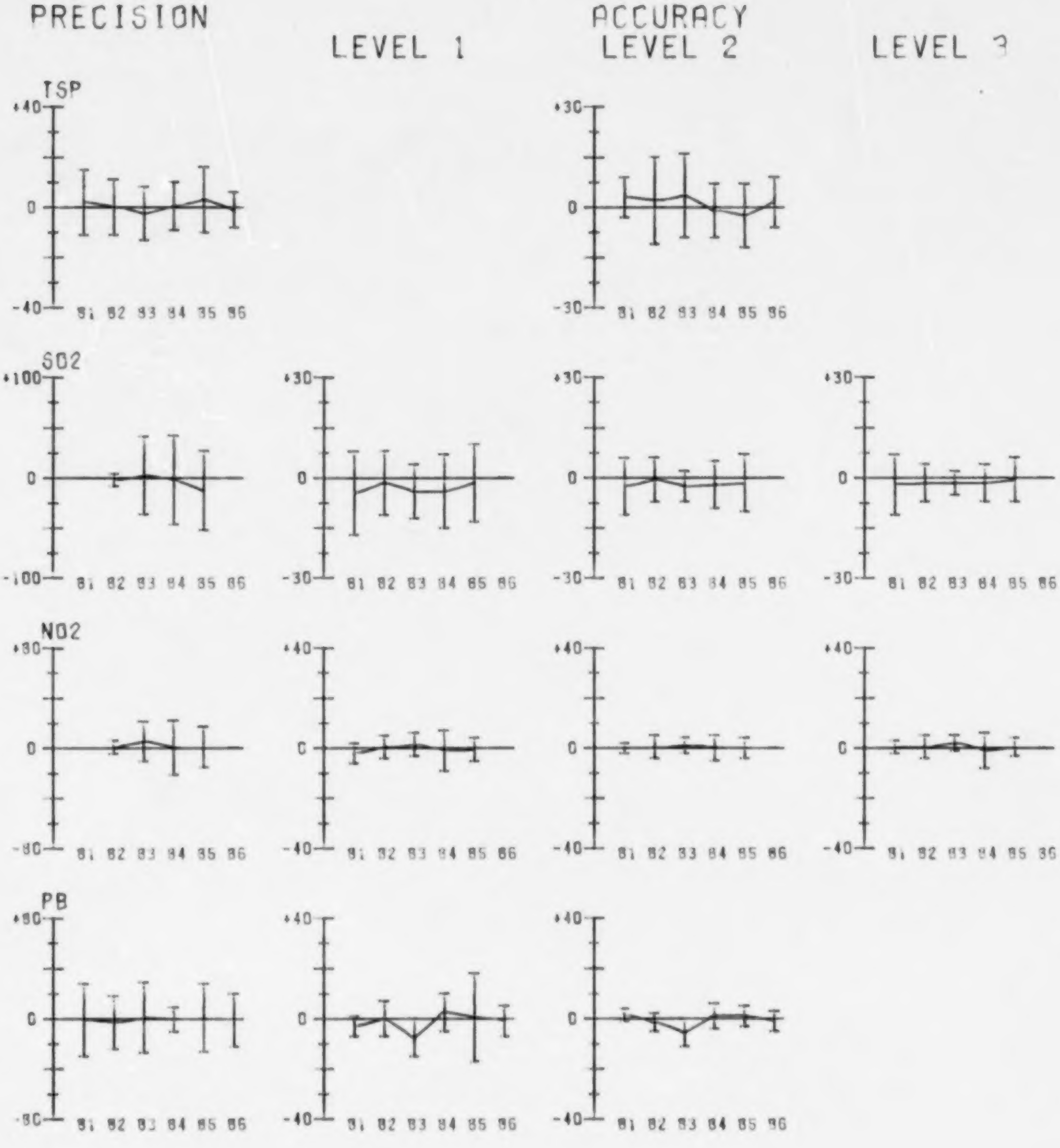
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 10 FLORIDA
REPORG: 012 FL, HILLSBOROUGH CO., ENV. SERVICES DIV.



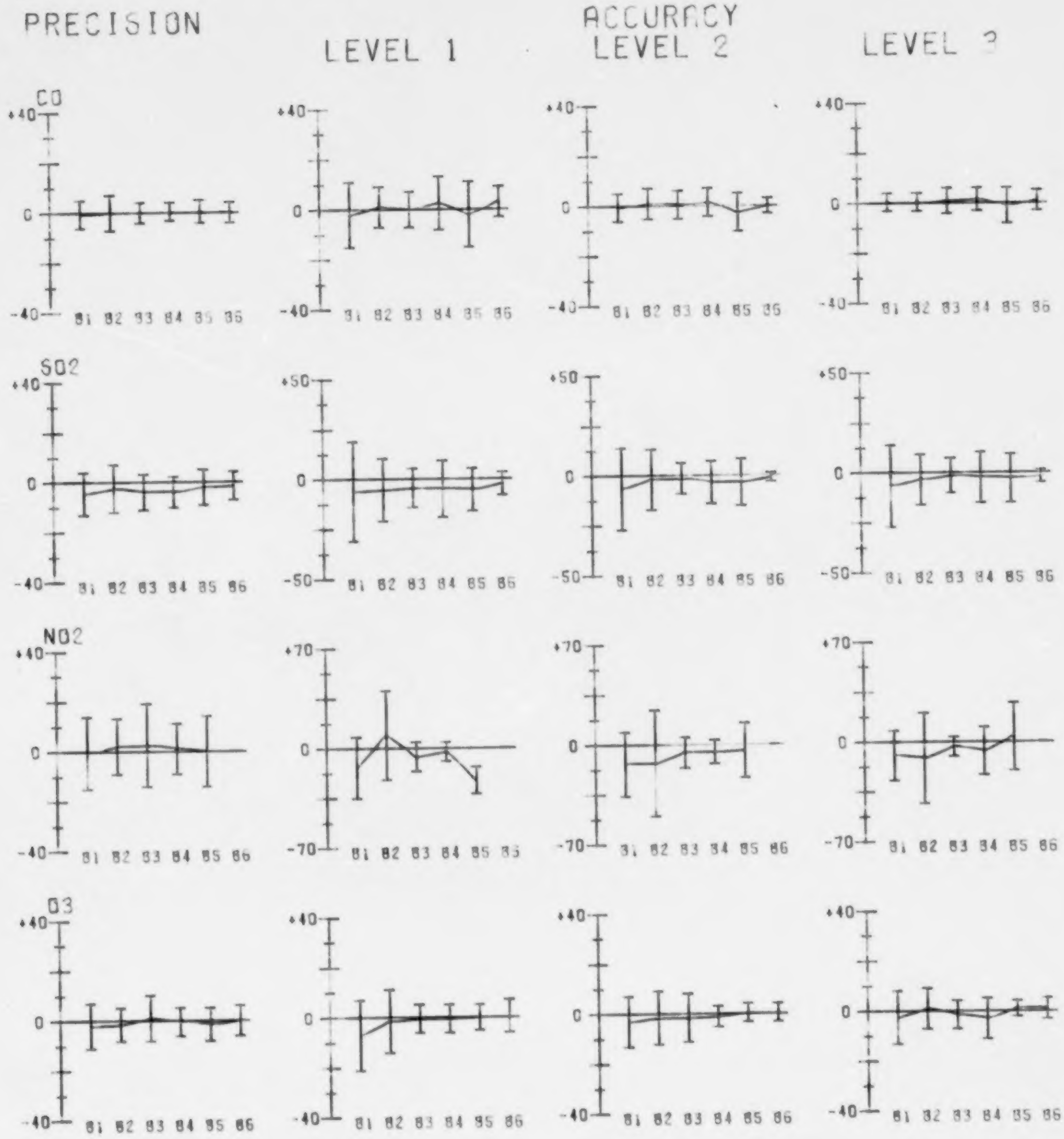
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 10 FLORIDA
REPORG: 012 FL, HILLSBOROUGH CO., ENV. SERVICES DIV.



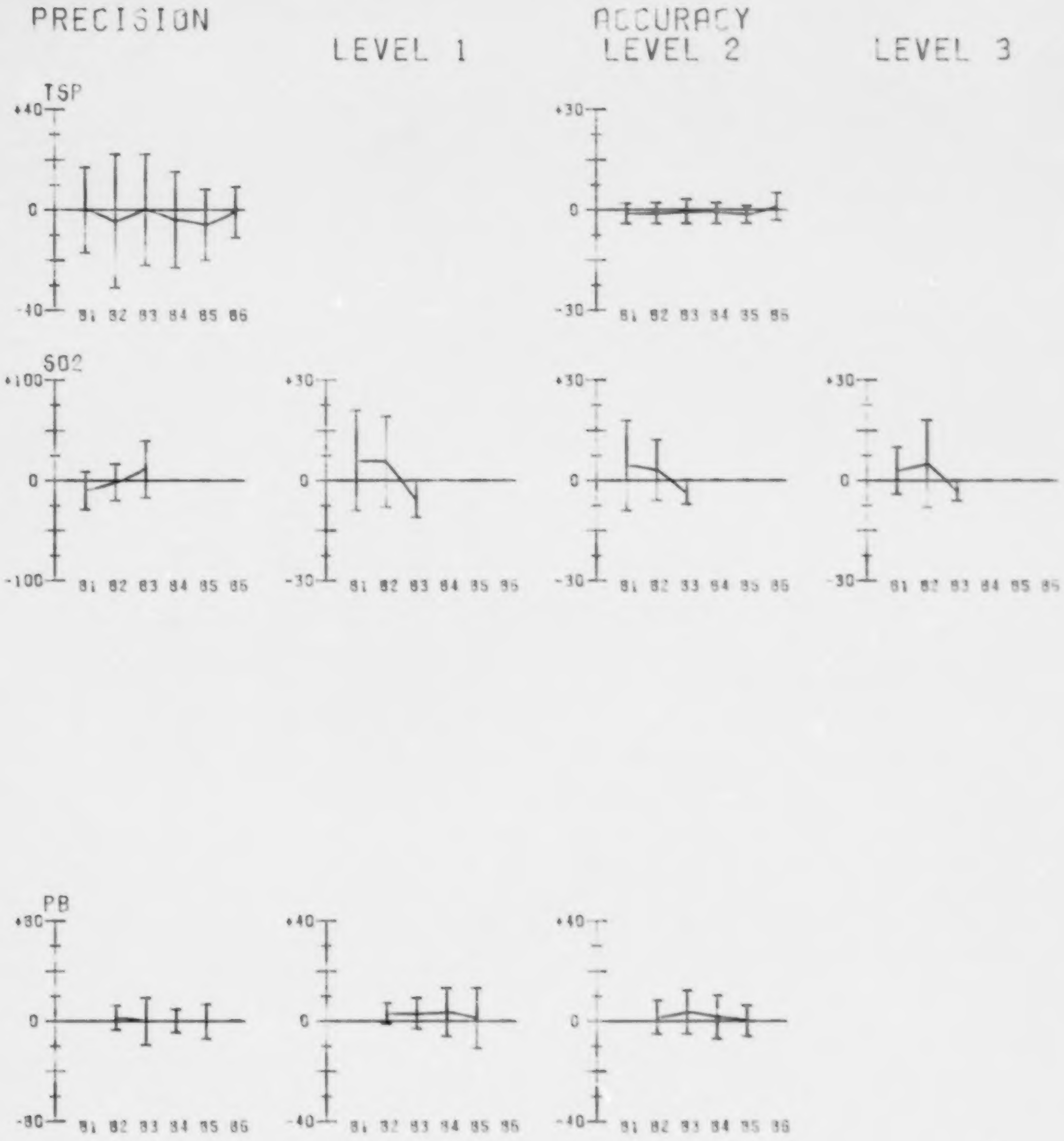
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 013 FL, PINELLAS CO. DEPT OF ENV. MANAGEMENT



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 013 FL, PINELLAS CO. DEPT OF ENV. MANAGEMENT

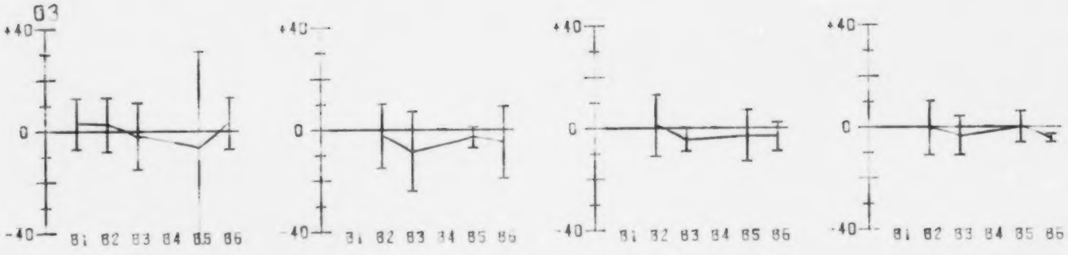


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 014 FL, MANATEE COUNTY HEALTH DEPARTMENT

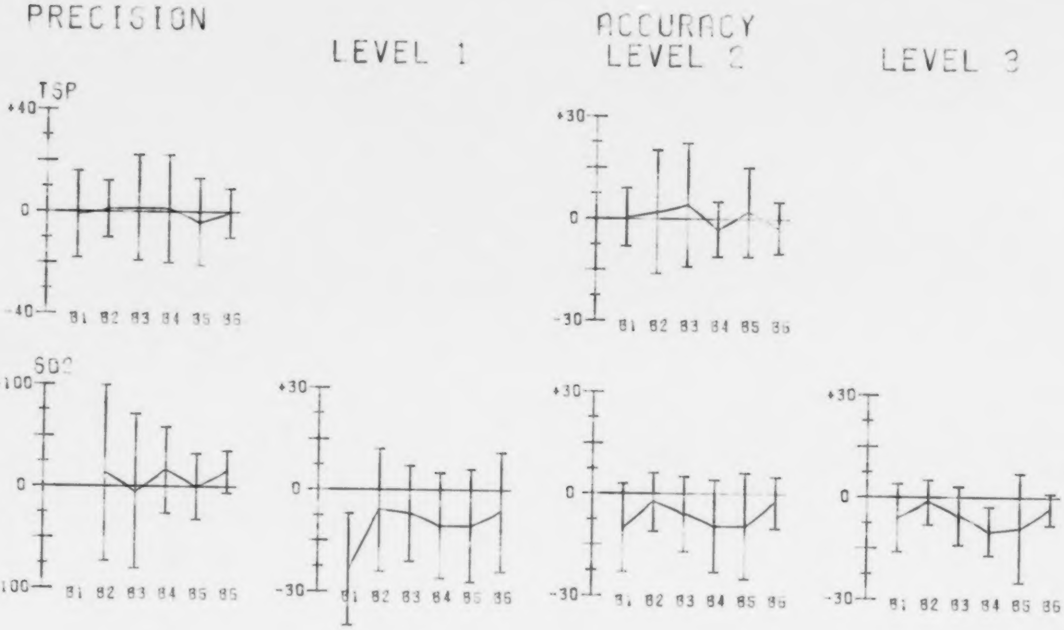
PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

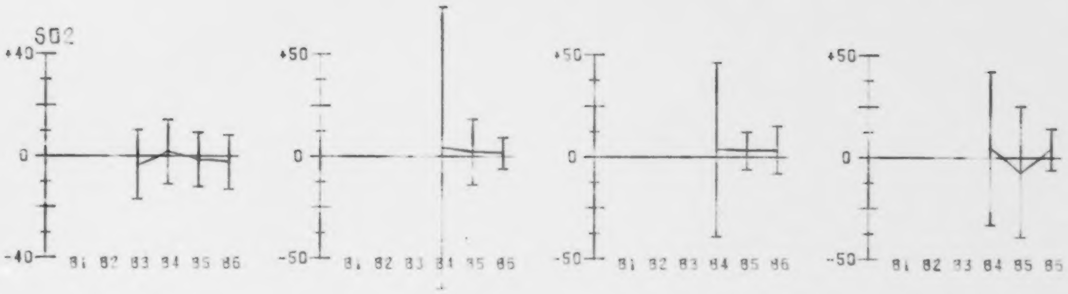
REG : 04
STATE : 10 FLORIDA
REPORG: 014 FL, MANATEE COUNTY HEALTH DEPARTMENT

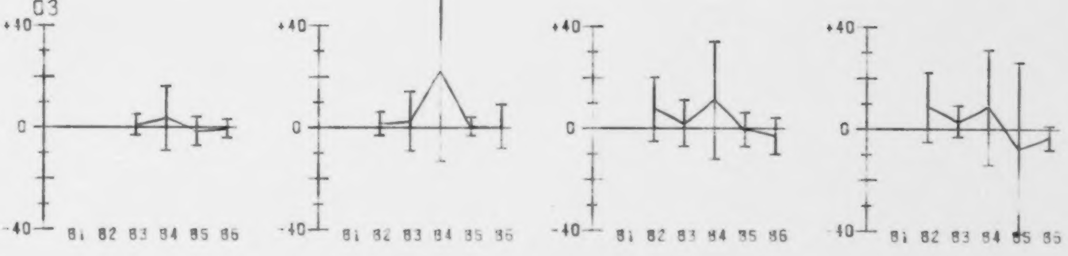


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 10 FLORIDA
REPORG: 015 FL, SARASOTA CO. AIR POLL. CONTROL DIV.

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 10 FLORIDA
REPORG: 015 FL, SARASOTA CO. AIR POLL. CONTROL DIV.

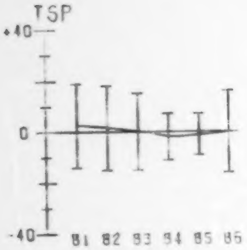
PRECISION

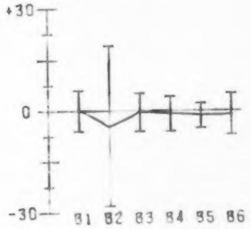
ACCURACY

LEVEL 1

LEVEL 2

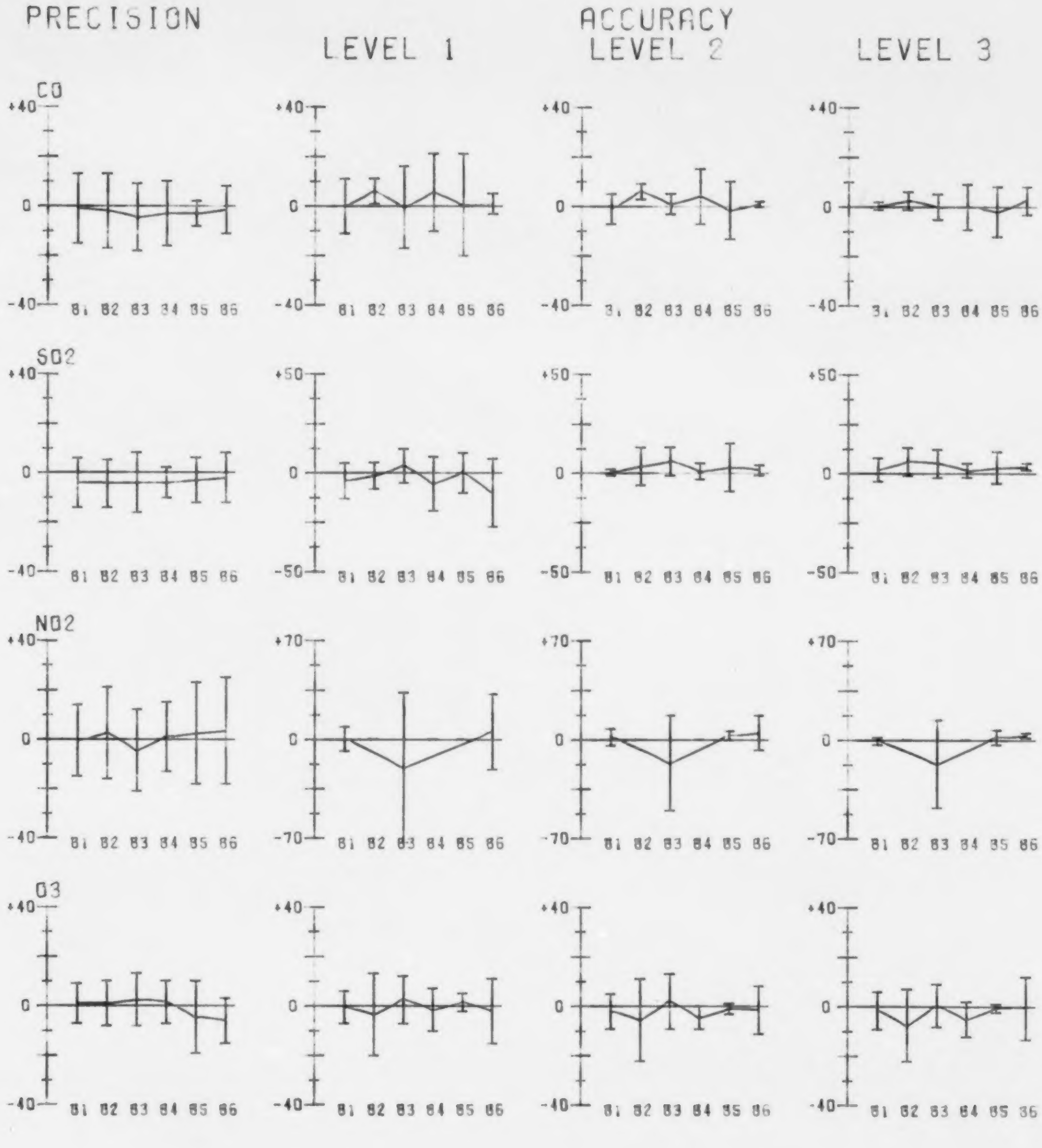
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 016 FL, PALM BEACH COUNTY HEALTH DEPARTMENT

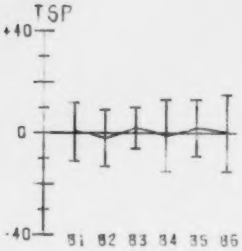


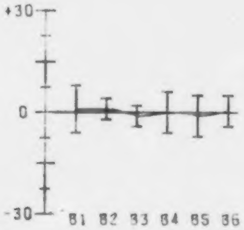
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 015 FL, PALM BEACH COUNTY HEALTH DEPARTMENT

PRECISION

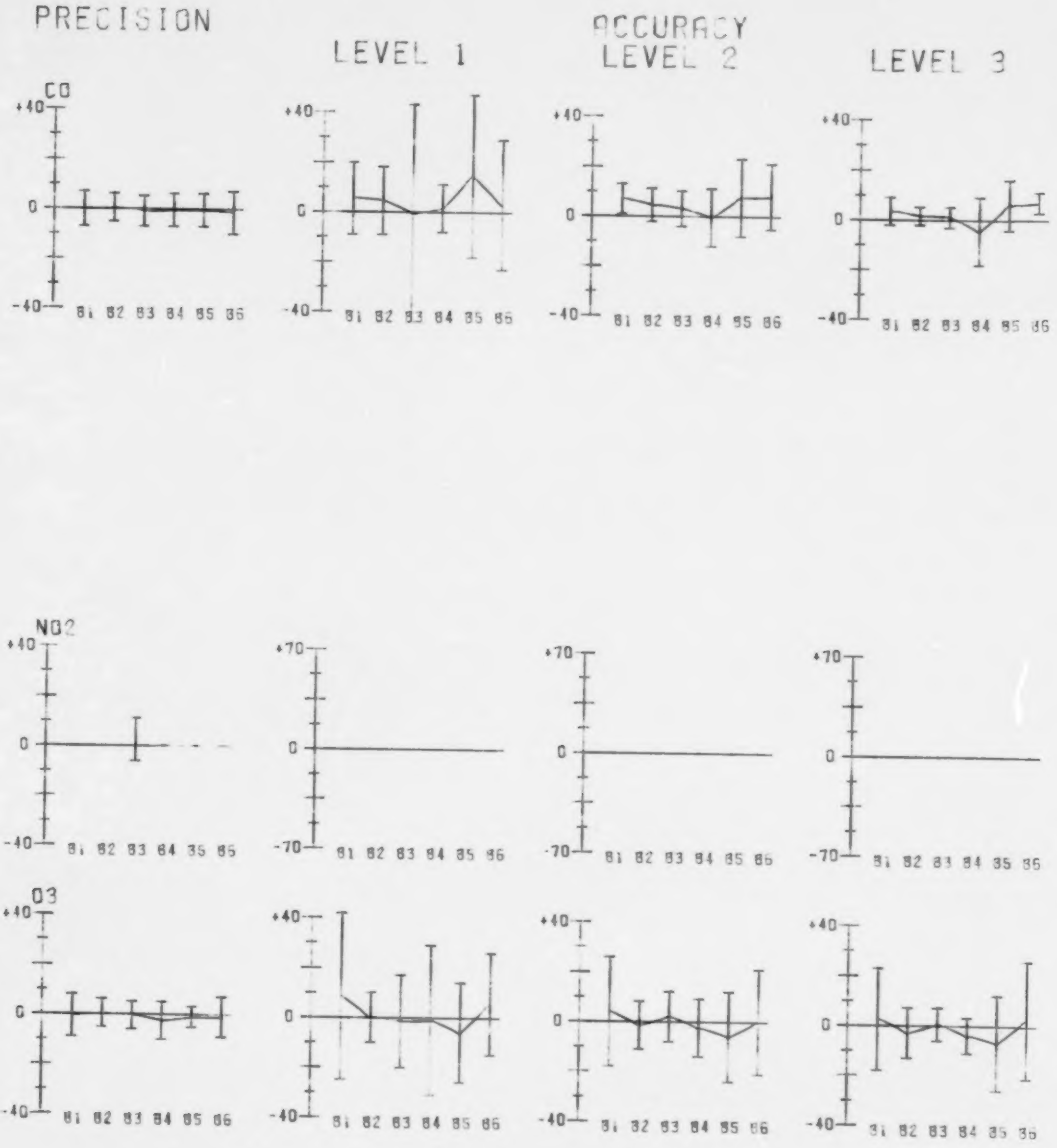
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





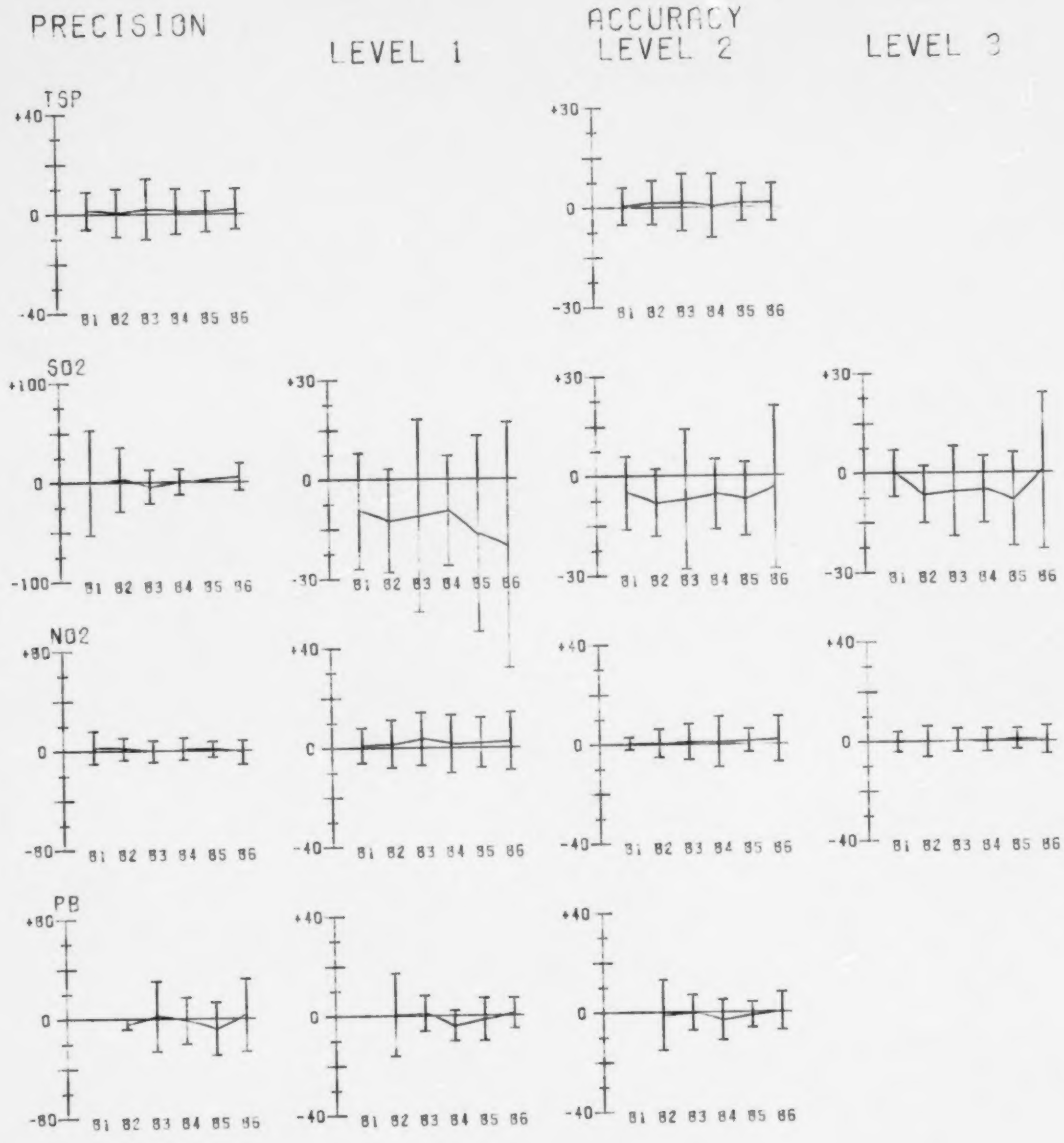
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 10 FLORIDA
REPORG: 017 FL, BROWARD CO. ENV. QUAL. CONTROL BOARD



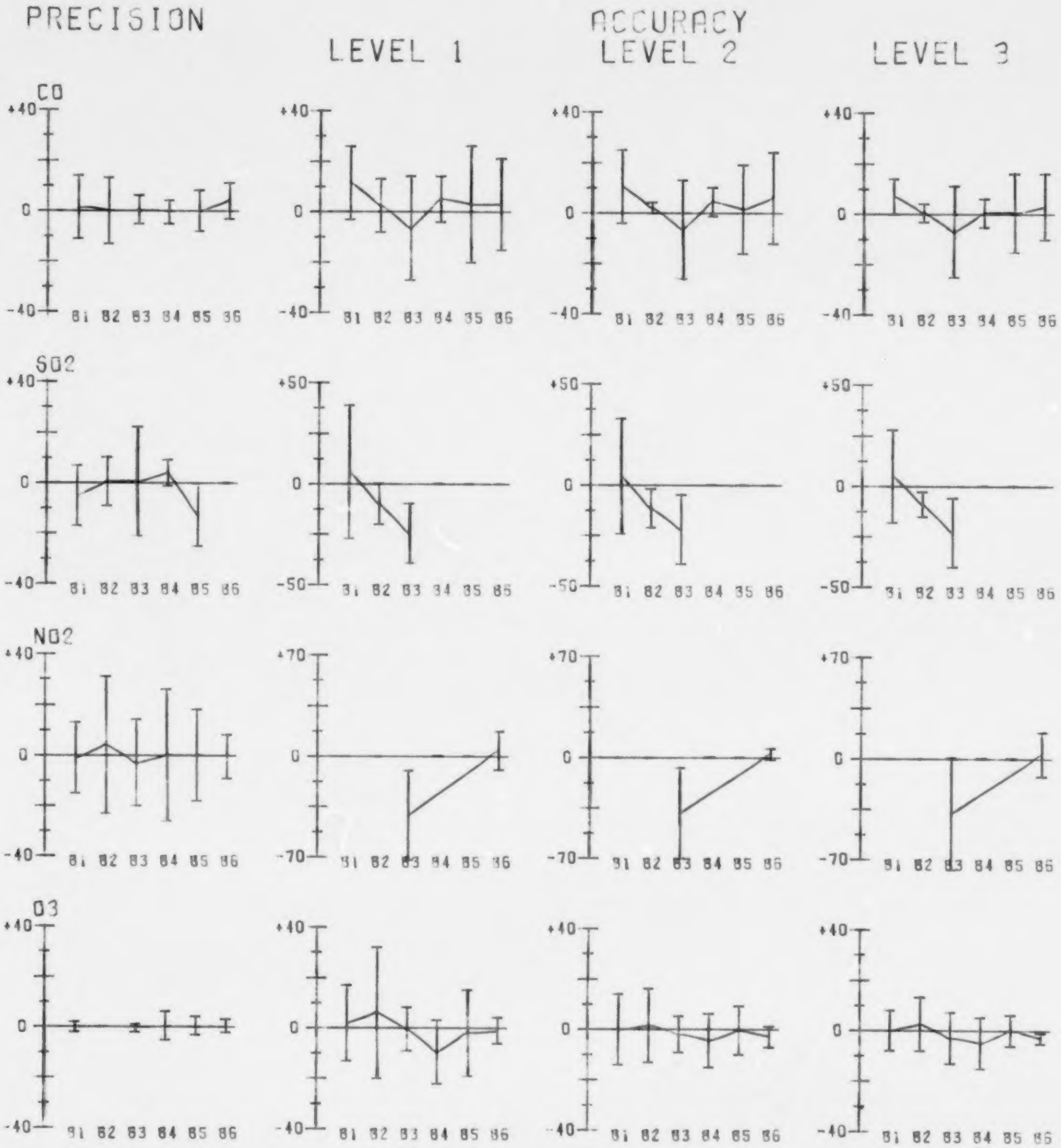
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 017 FL, BROWARD CO. ENV. QUAL. CONTROL BOARD



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 018 FL, DADE CO. DEPT OF ENV. RESOURCES MGMT

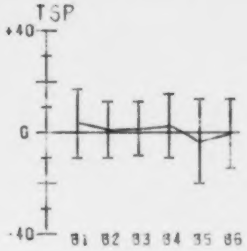


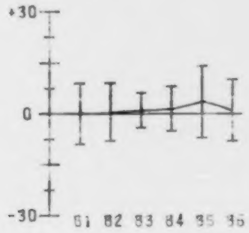
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

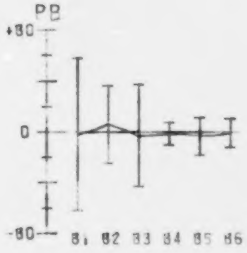
REG : 04
STATE : 10 FLORIDA
REPORG: 019 FL, DADE CO. DEPT OF ENV. RESOURCES MGMT

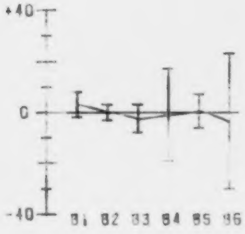
PRECISION

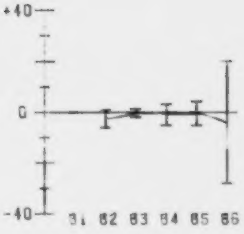
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





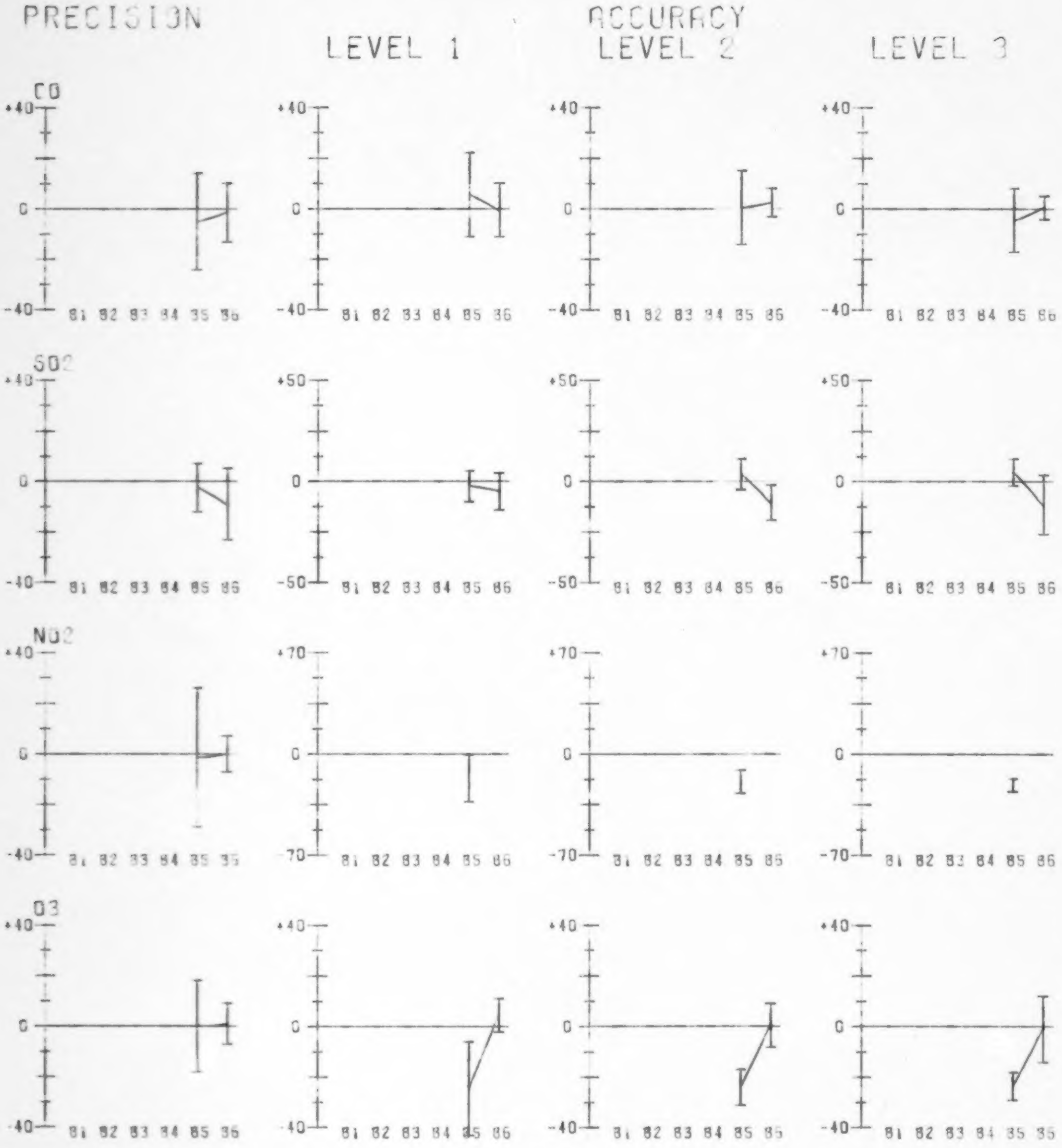






95% PROBABILITY LIMITS 81-85
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 020 **ORANGE** COUNTY HEALTH DEPARTMENT

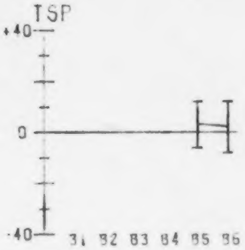


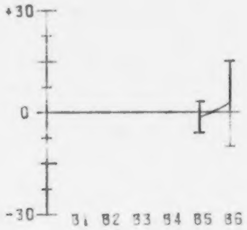
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 10 FLORIDA
REPORG: 020 **ORANGE** COUNTY HEALTH DEPARTMENT

PRECISION   ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3



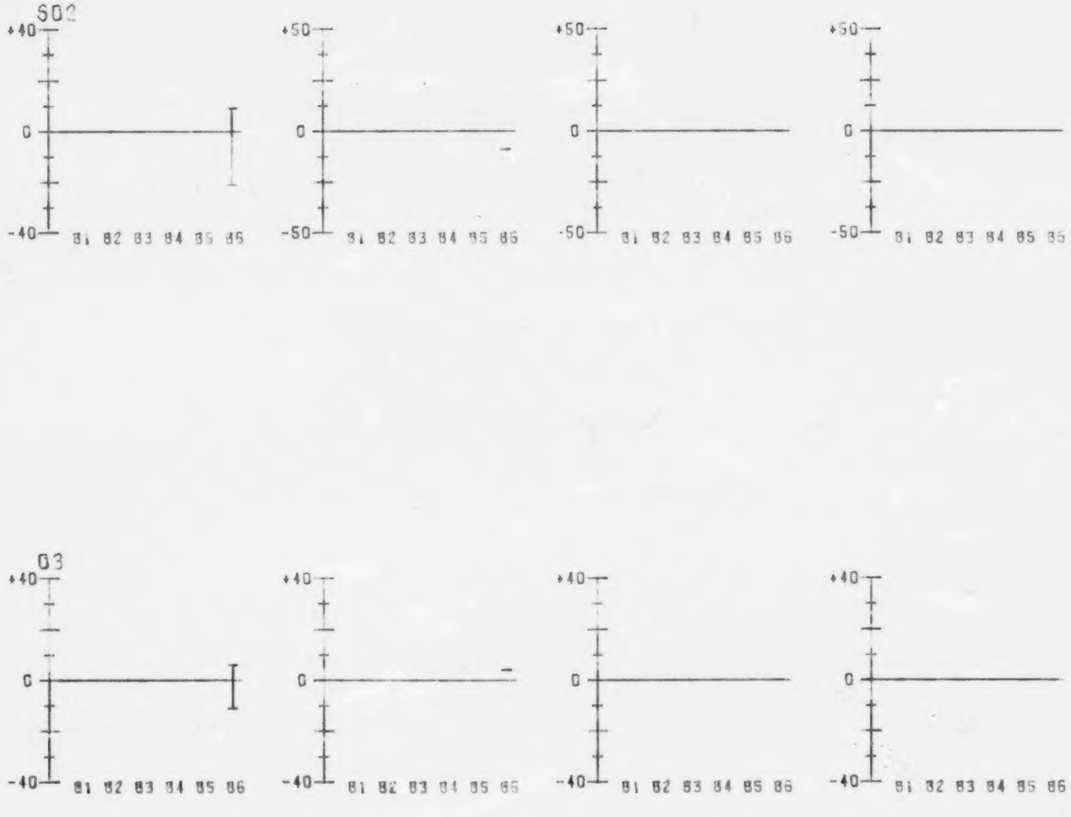


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 10 FLORIDA
REPORG: 022 EVERGLADES NATIONAL PARK

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



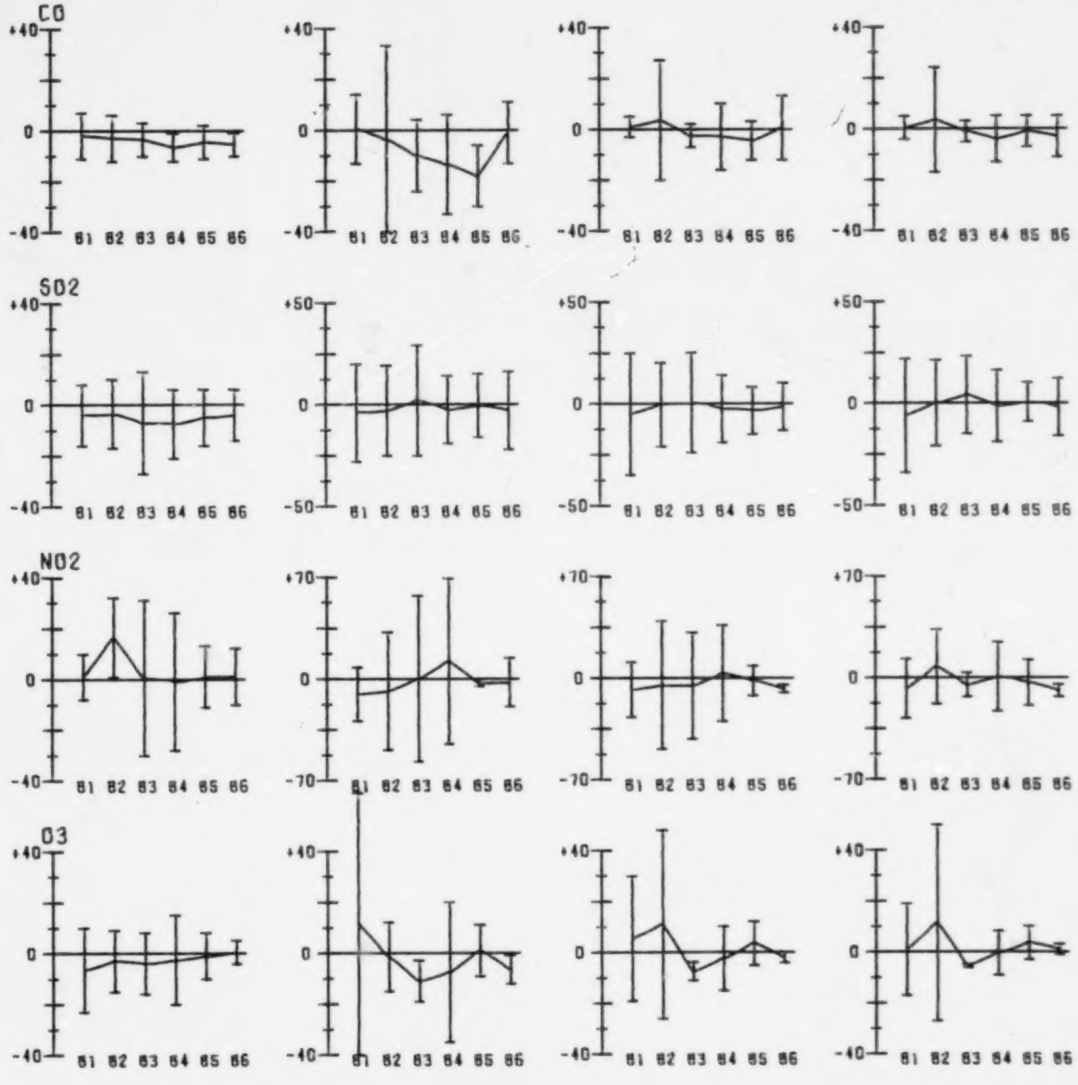
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 11 GEORGIA
REPORG: 010 GEORGIA AIR QUAL. EVALUATION SECTION EPD

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3



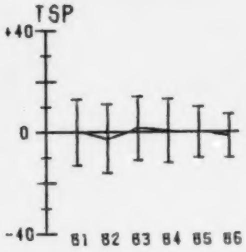
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

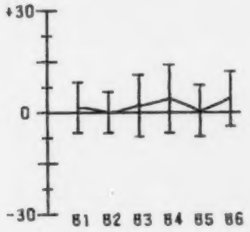
REG   : 04
STATE : 11 GEORGIA
REPORG: 010 GEORGIA AIR QUAL. EVALUATION SECTION EPD

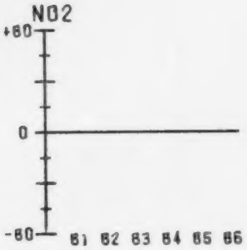
PRECISION

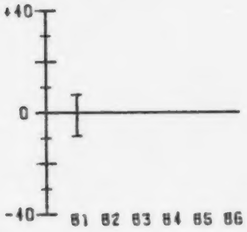
ACCURACY

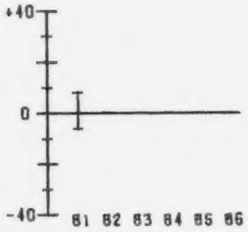
LEVEL 1   LEVEL 2   LEVEL 3

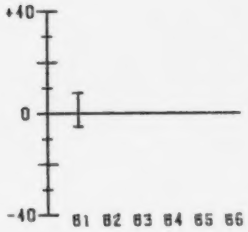


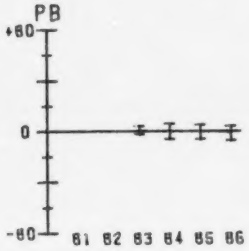


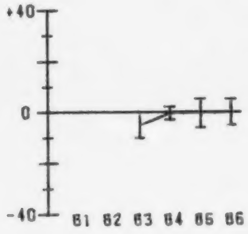


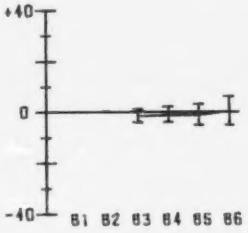






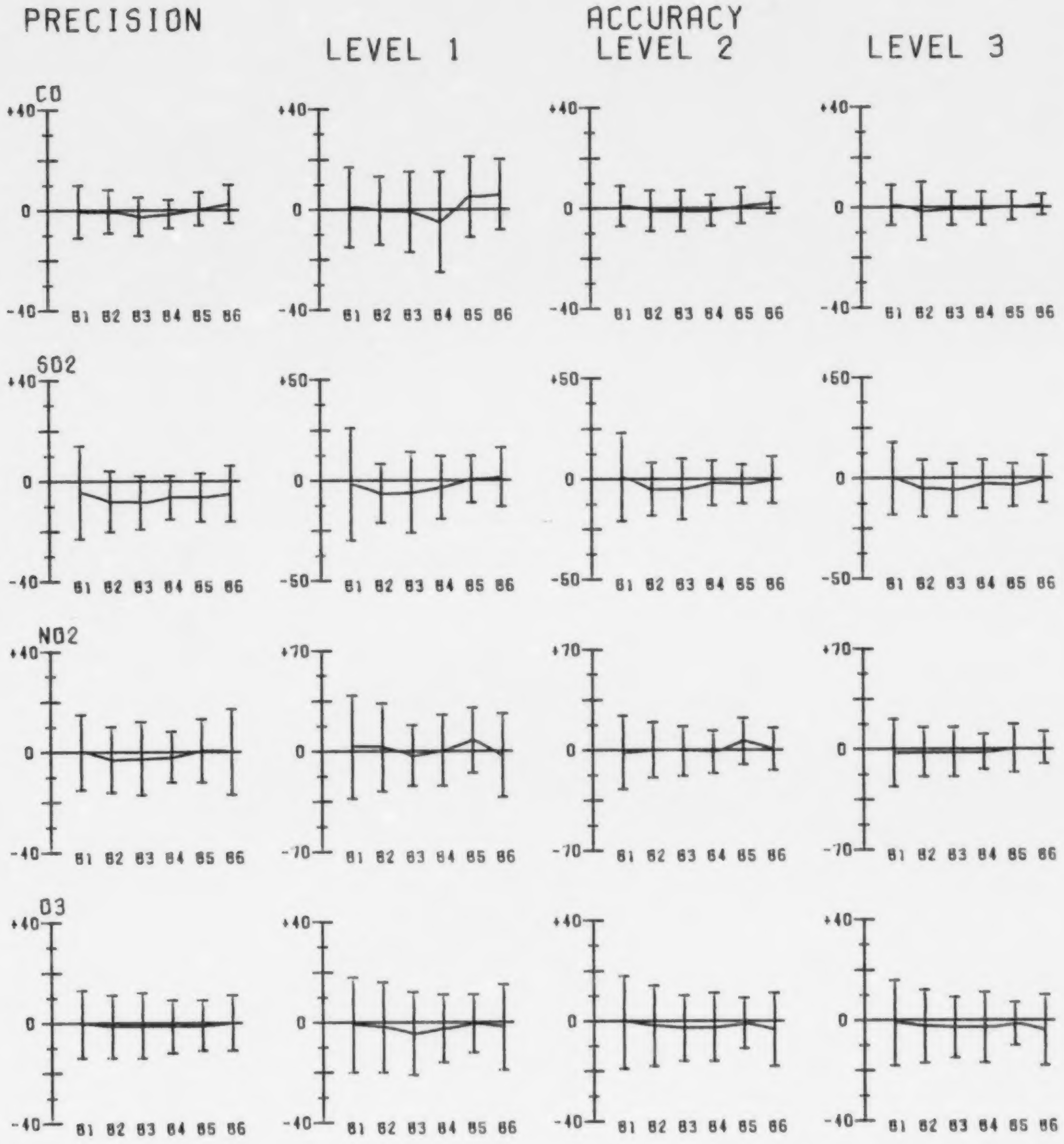






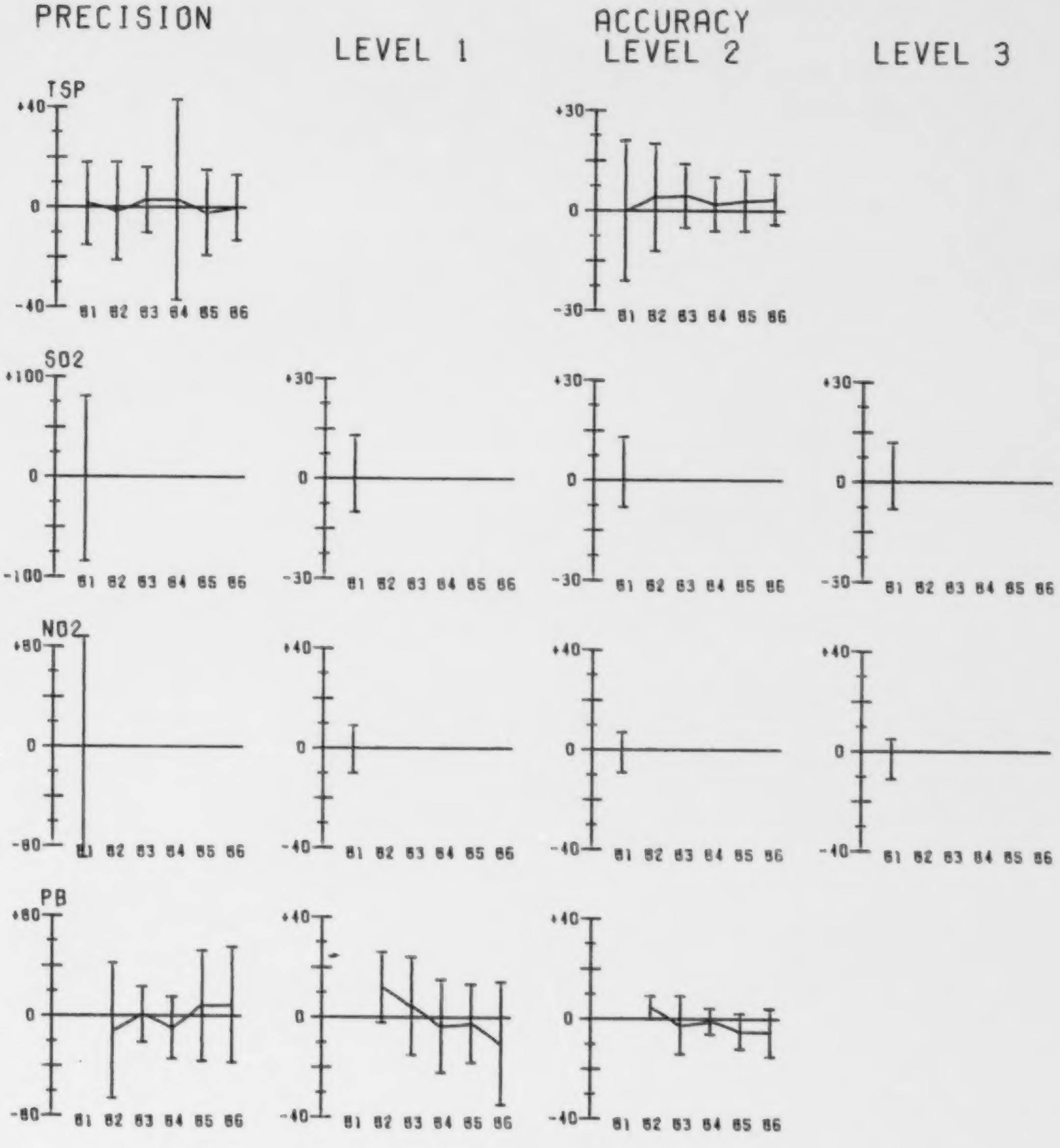
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 18 KENTUCKY
REPORG: 001 KENTUCKY DIV. OF AIR POLL. CONTROL



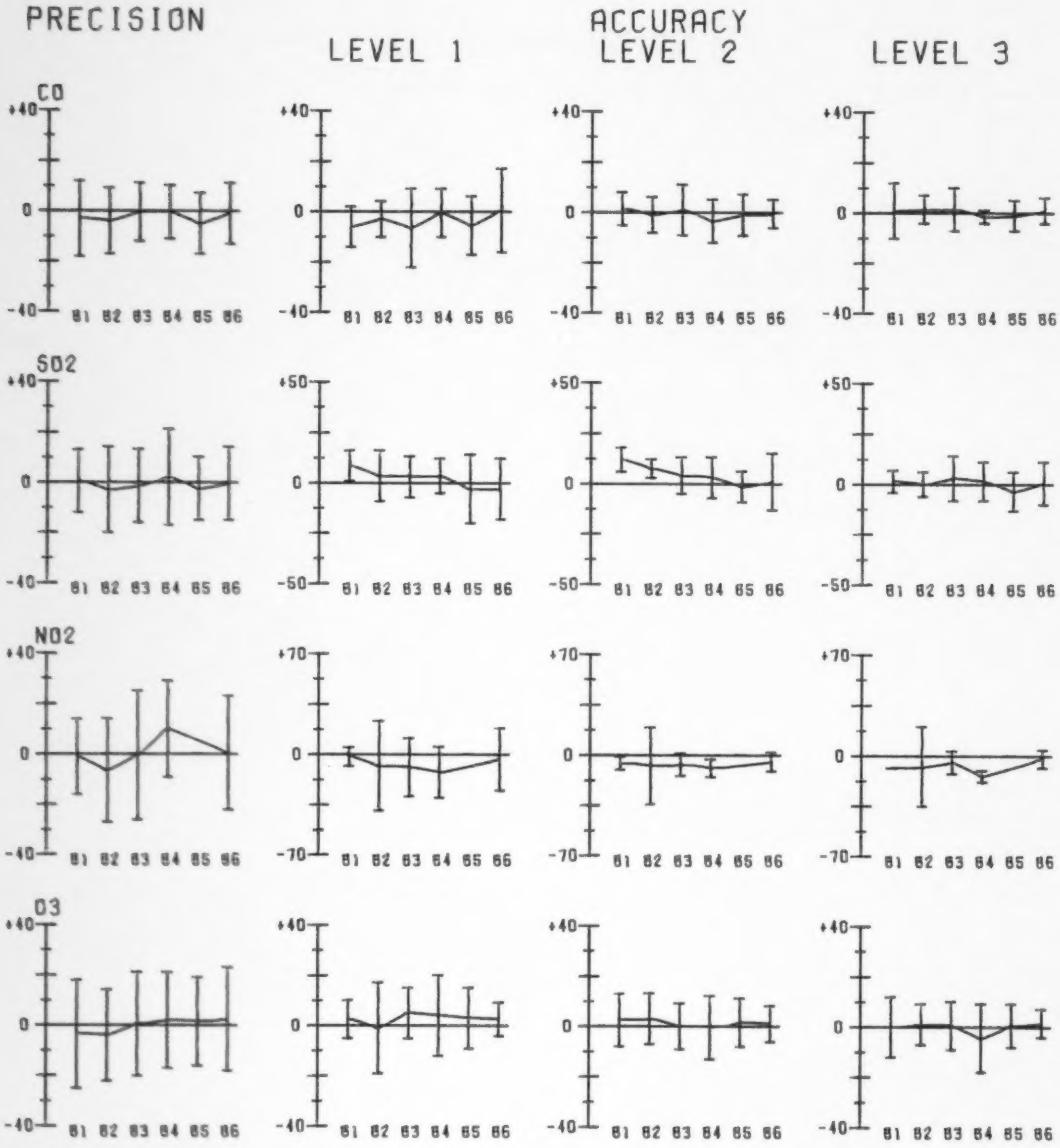
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 18 KENTUCKY
REPORG: 001 KENTUCKY DIV. OF AIR POLL. CONTROL



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 18 KENTUCKY
REPORG: 002 KY, JEFFERSON CO. AIR POLL. CONTROL DIST



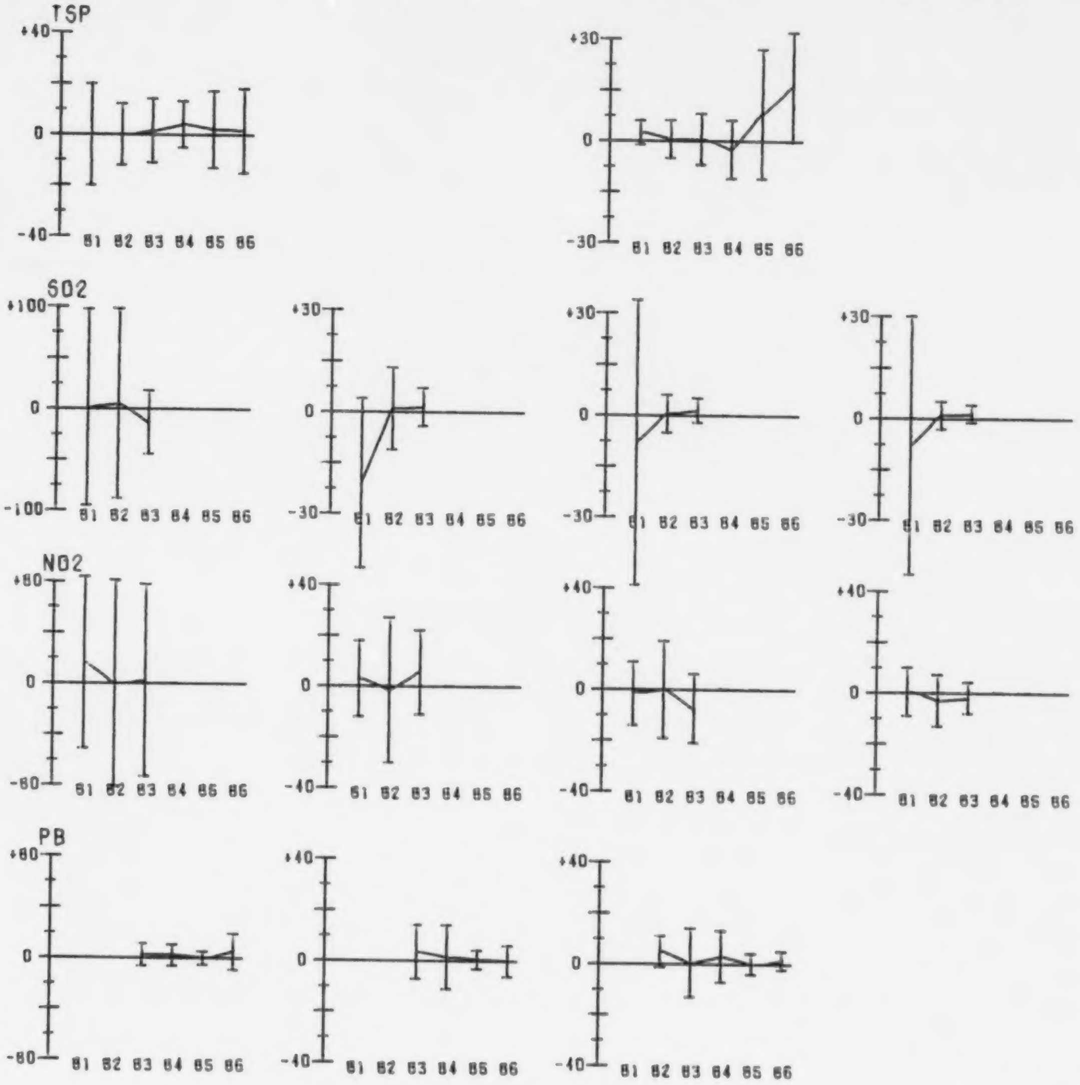
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 18 KENTUCKY
REPORG: 002 KY, JEFFERSON CO. AIR POLL. CONTROL DIST

PRECISION

ACCURACY

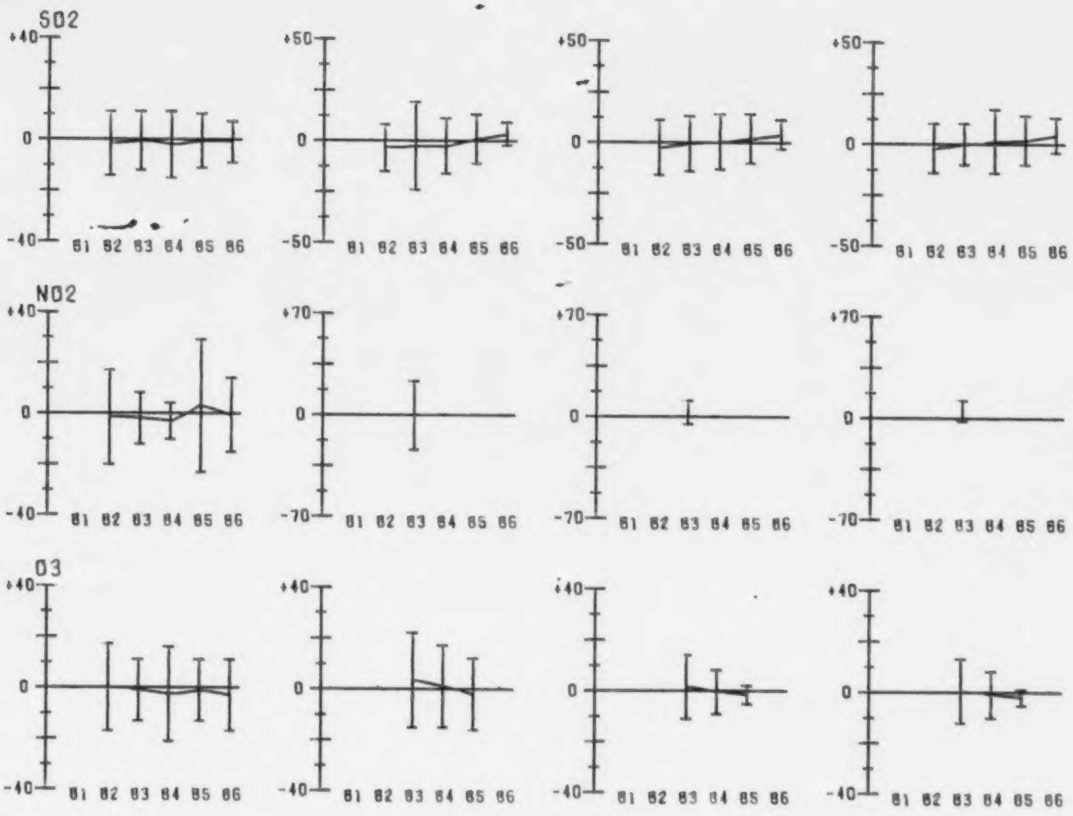
LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 18 KENTUCKY
REPORG: 003 TENNESSEE VALLEY AUTHORITY - KENTUCKY

PRECISION — ACCURACY: LEVEL 1, LEVEL 2, LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

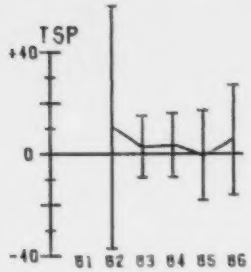
REG : 04
STATE : 18 KENTUCKY
REPORG: 003 TENNESSEE VALLEY AUTHORITY - KENTUCKY

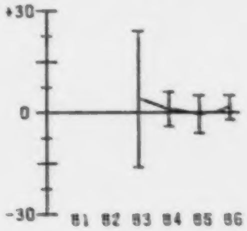
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

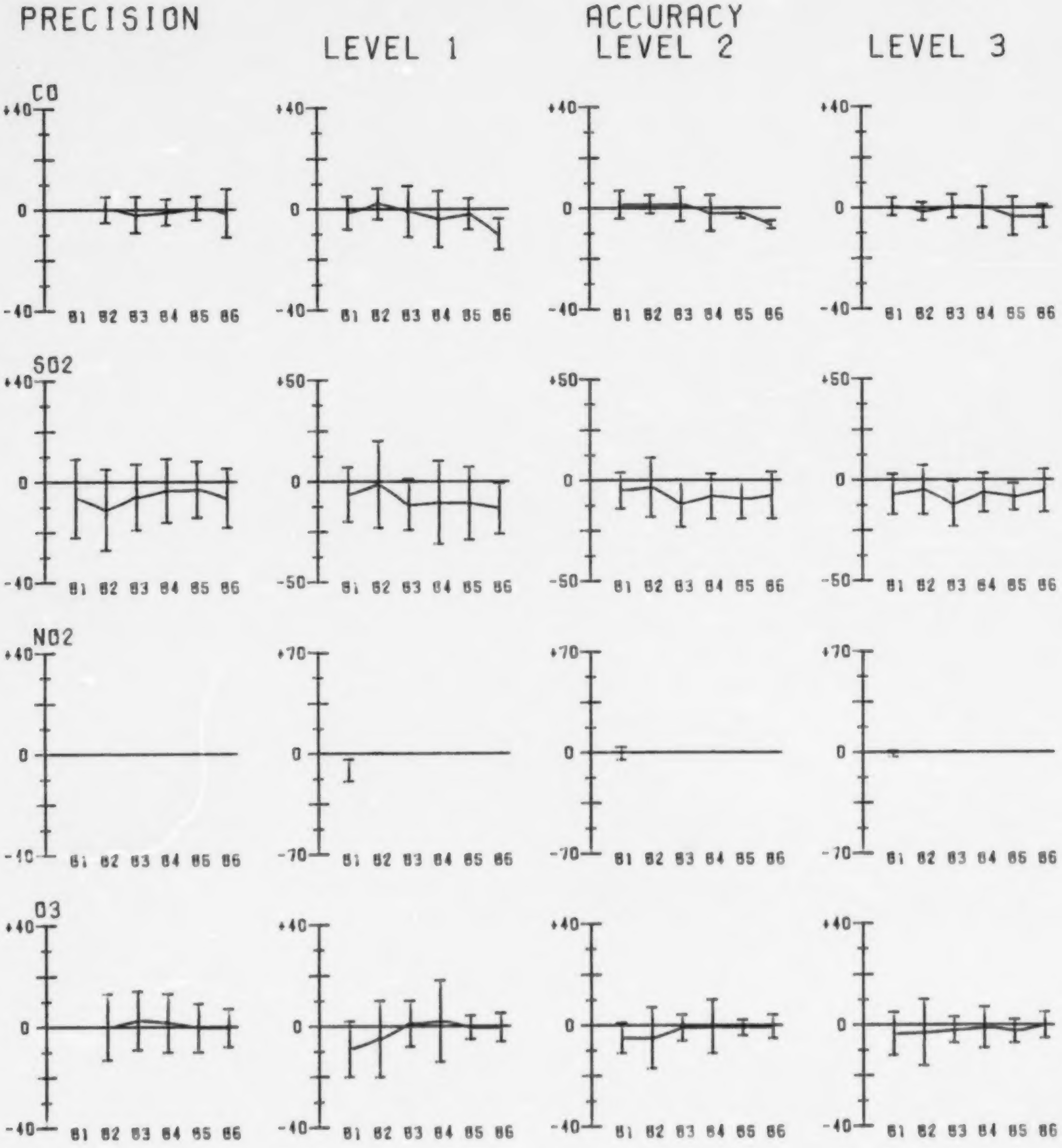
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 25 MISSISSIPPI
REPORG: 100 MISSISSIPPI BUREAU OF POLLUTION CONTROL



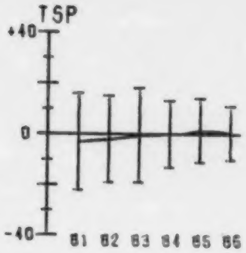
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

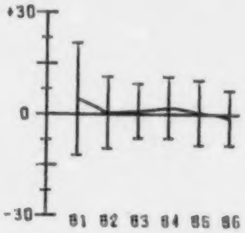
REG   : 04
STATE : 25 MISSISSIPPI
REPORG: 100 MISSISSIPPI BUREAU OF POLLUTION CONTROL

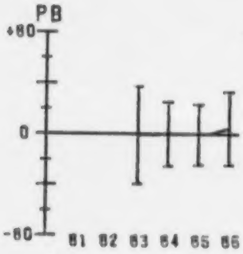
PRECISION

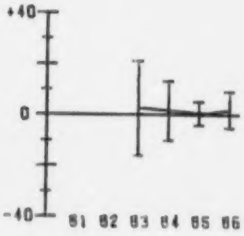
ACCURACY

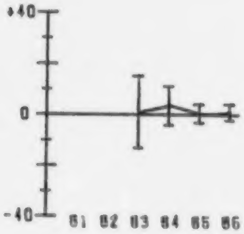
LEVEL 1   LEVEL 2   LEVEL 3





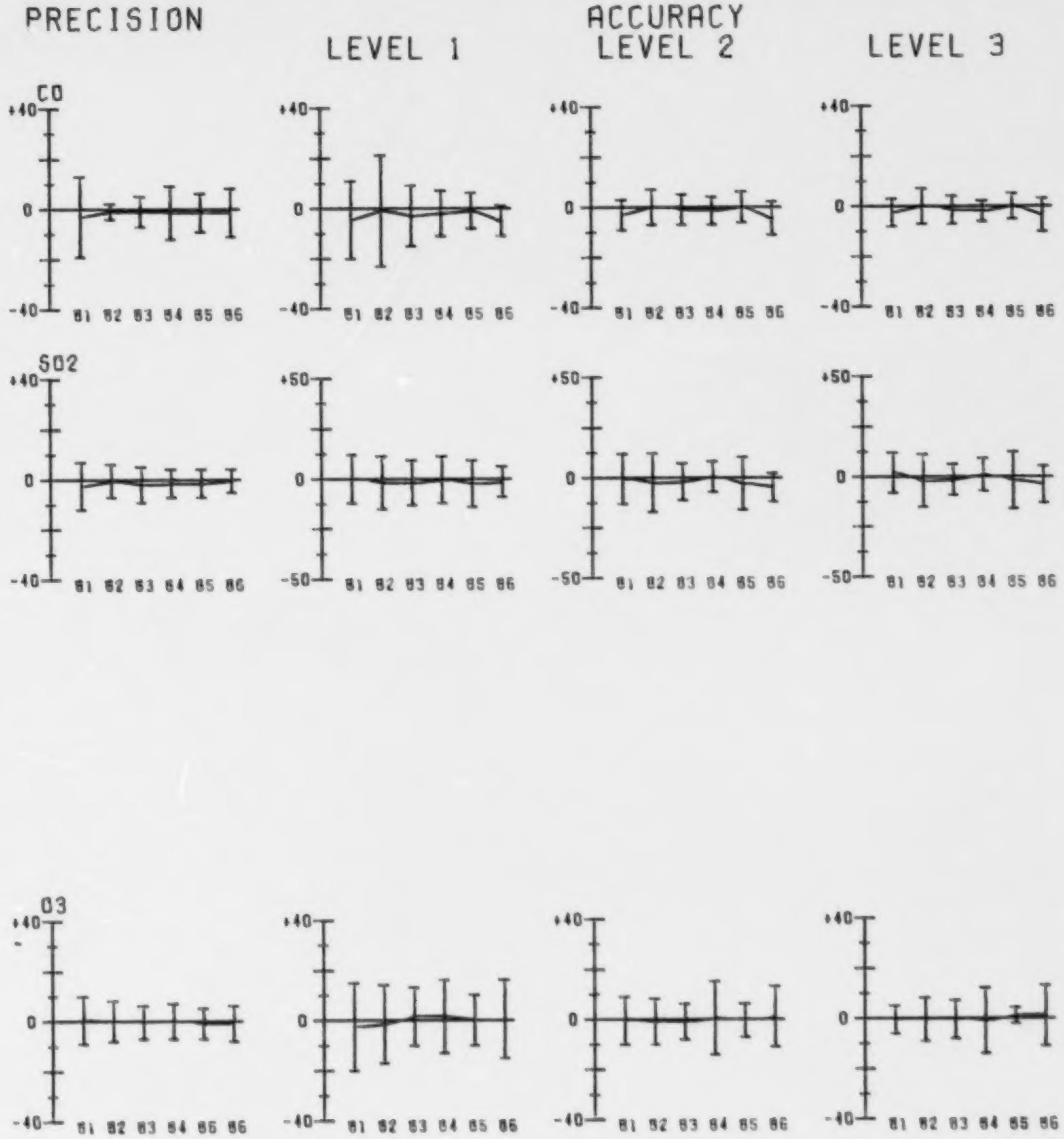






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 34 NORTH CAROLINA
REPORG: 001 NC NATURAL RESOURCES & COMMUNITY DEVEL.

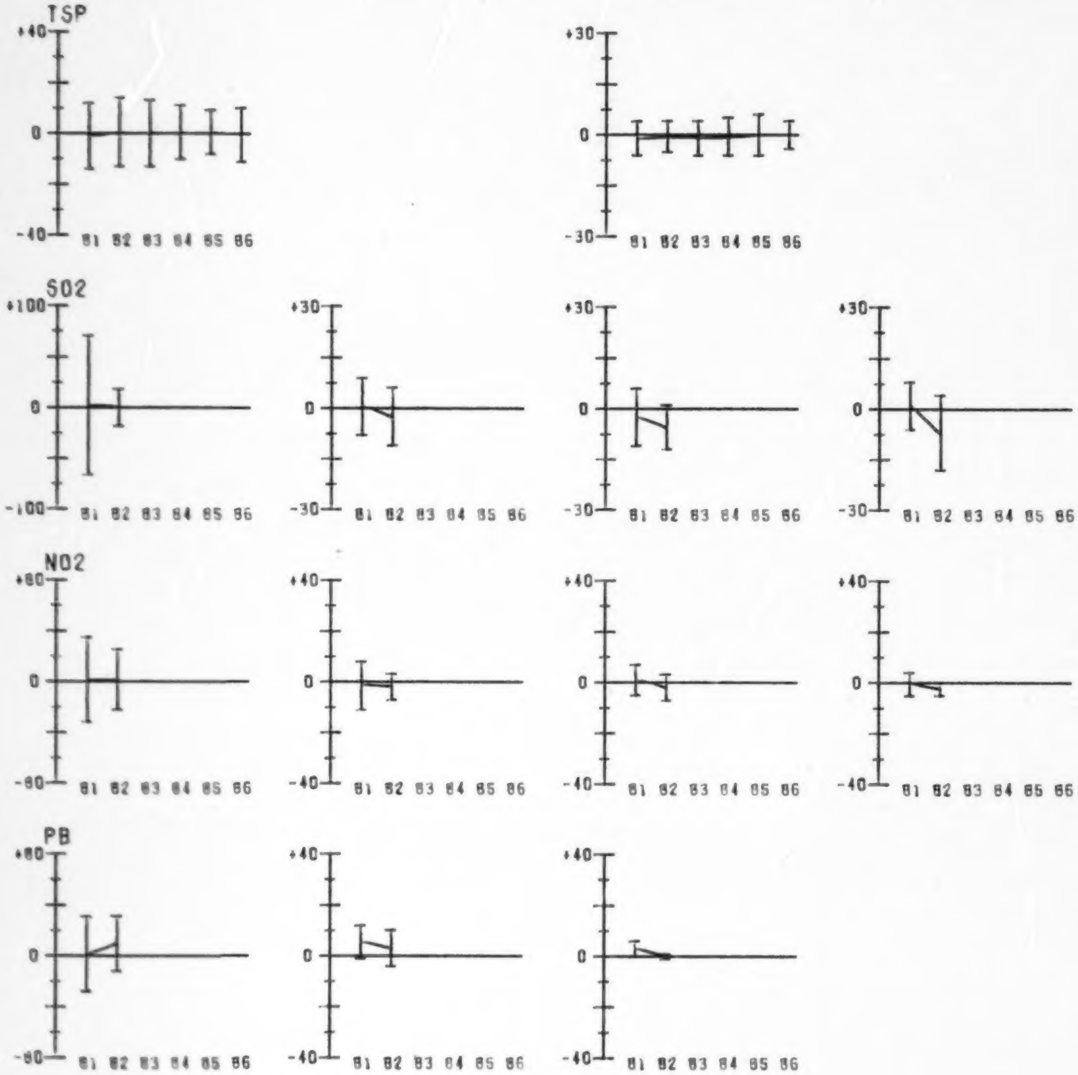


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 34 NORTH CAROLINA
REPORG: 001 NC NATURAL RESOURCES & COMMUNITY DEVEL.

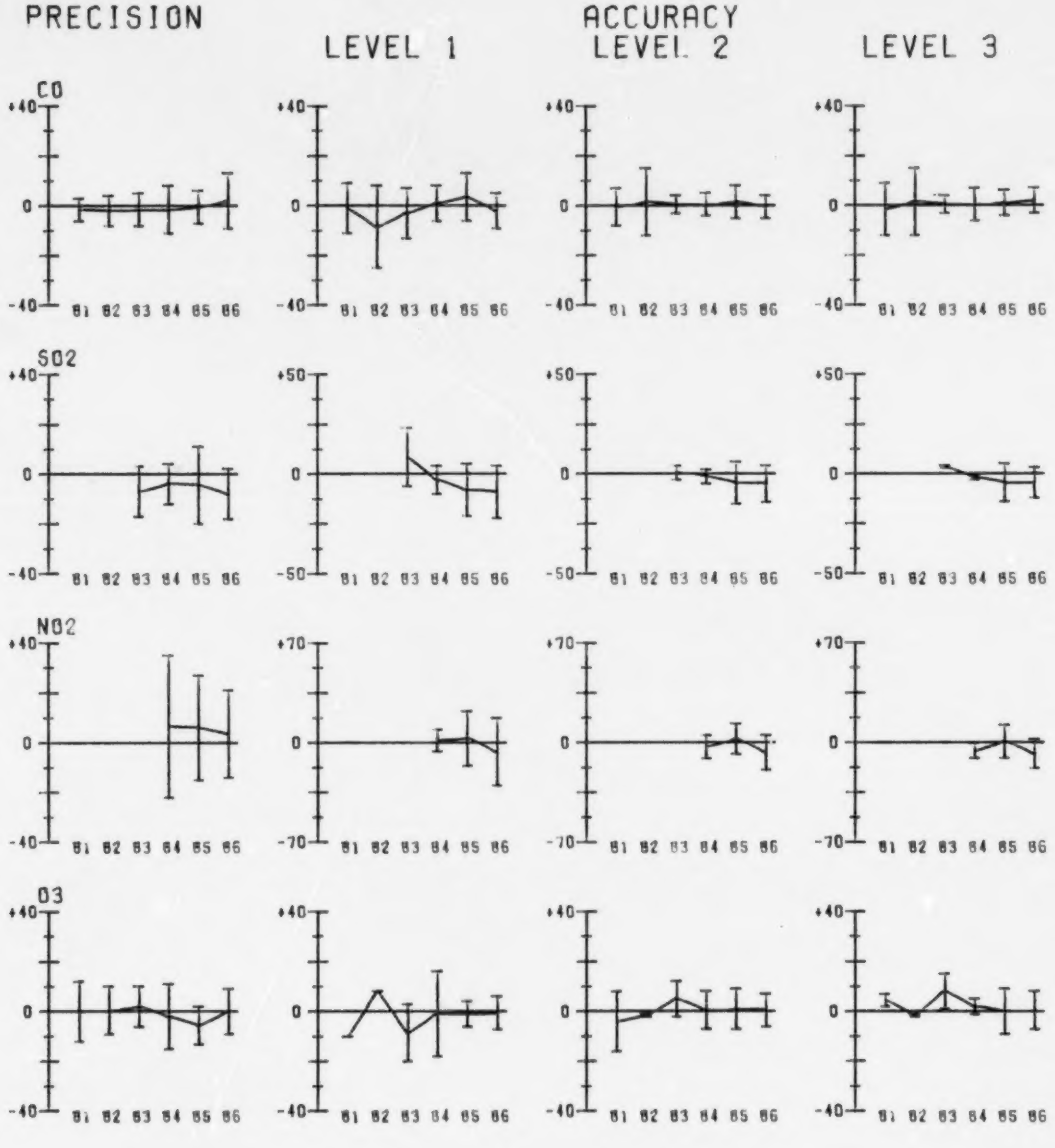
PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 34 NORTH CAROLINA
REPORG : 002 NC, FORSYTH COUNTY ENV. AFFAIRS DEPT.

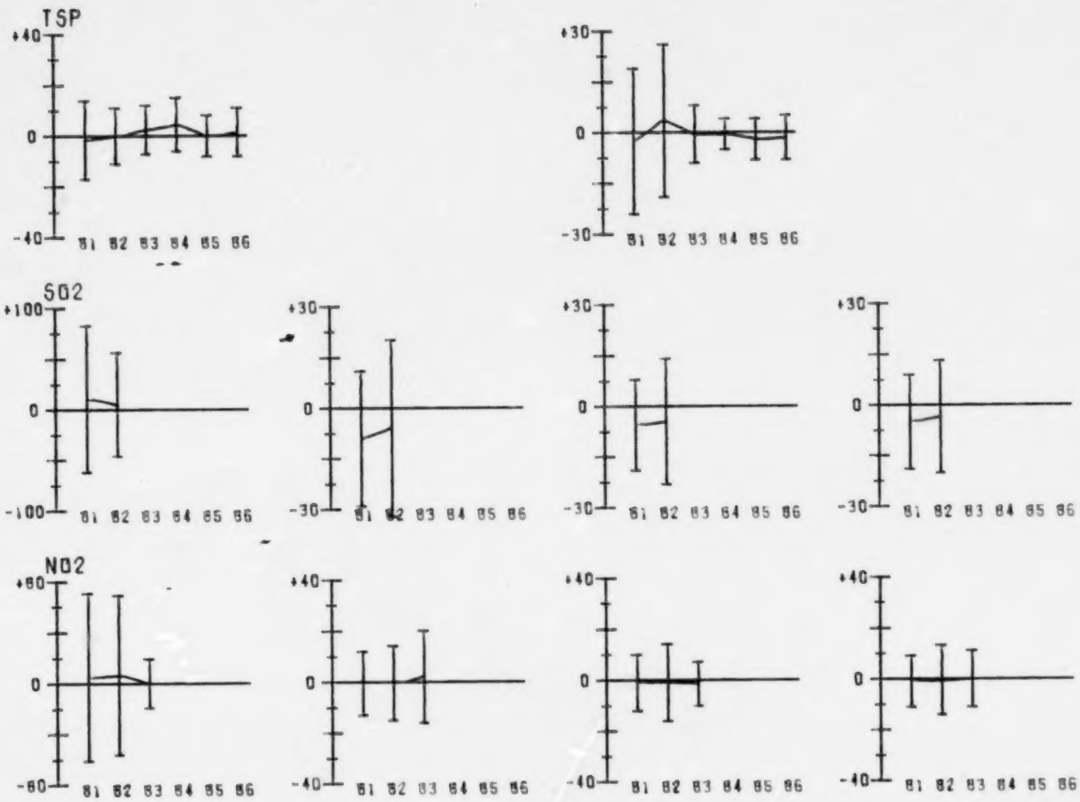


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 04
STATE : 34 NORTH CAROLINA
REPORG: 002 NC, FORSYTH COUNTY ENV. AFFAIRS DEPT.

PRECISION

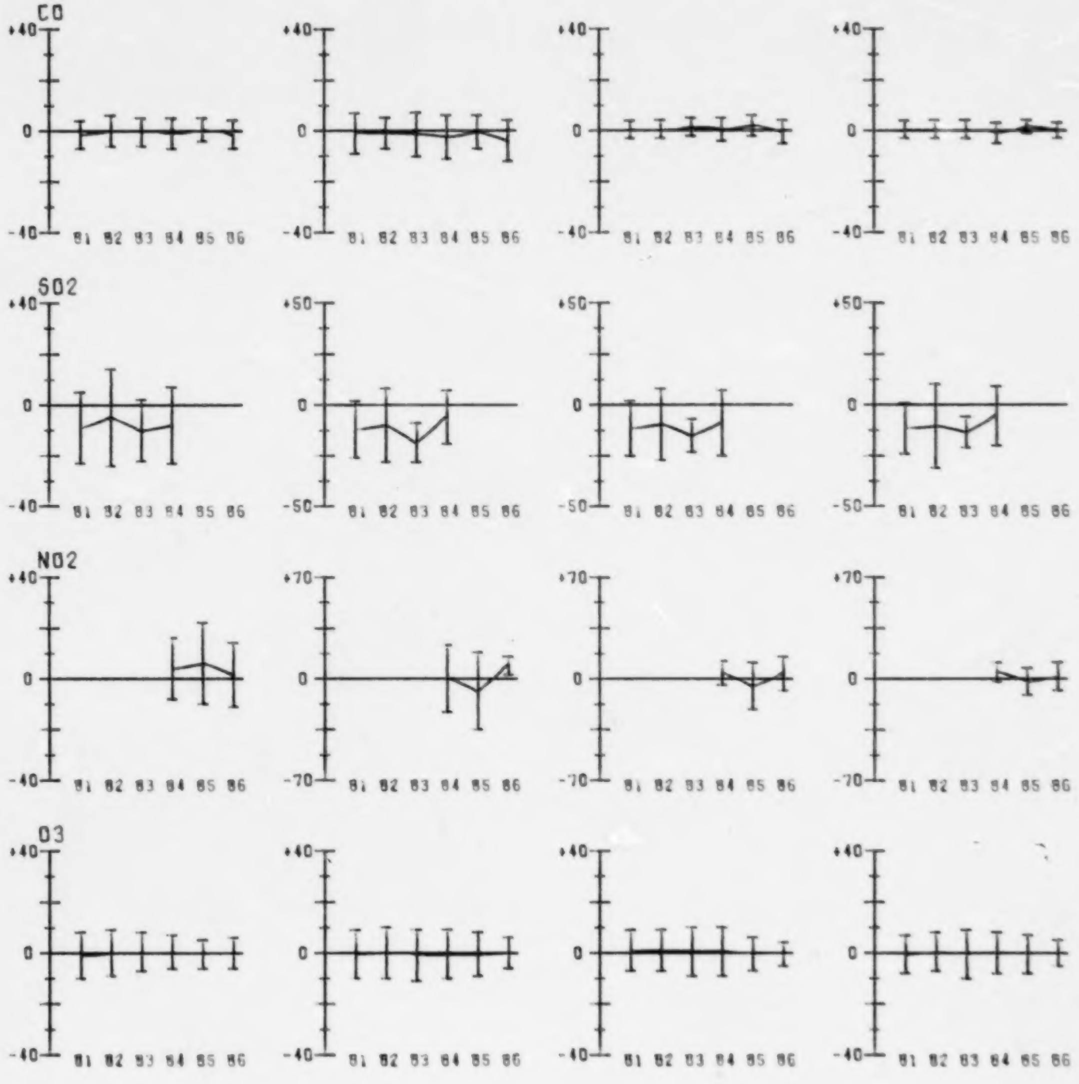
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

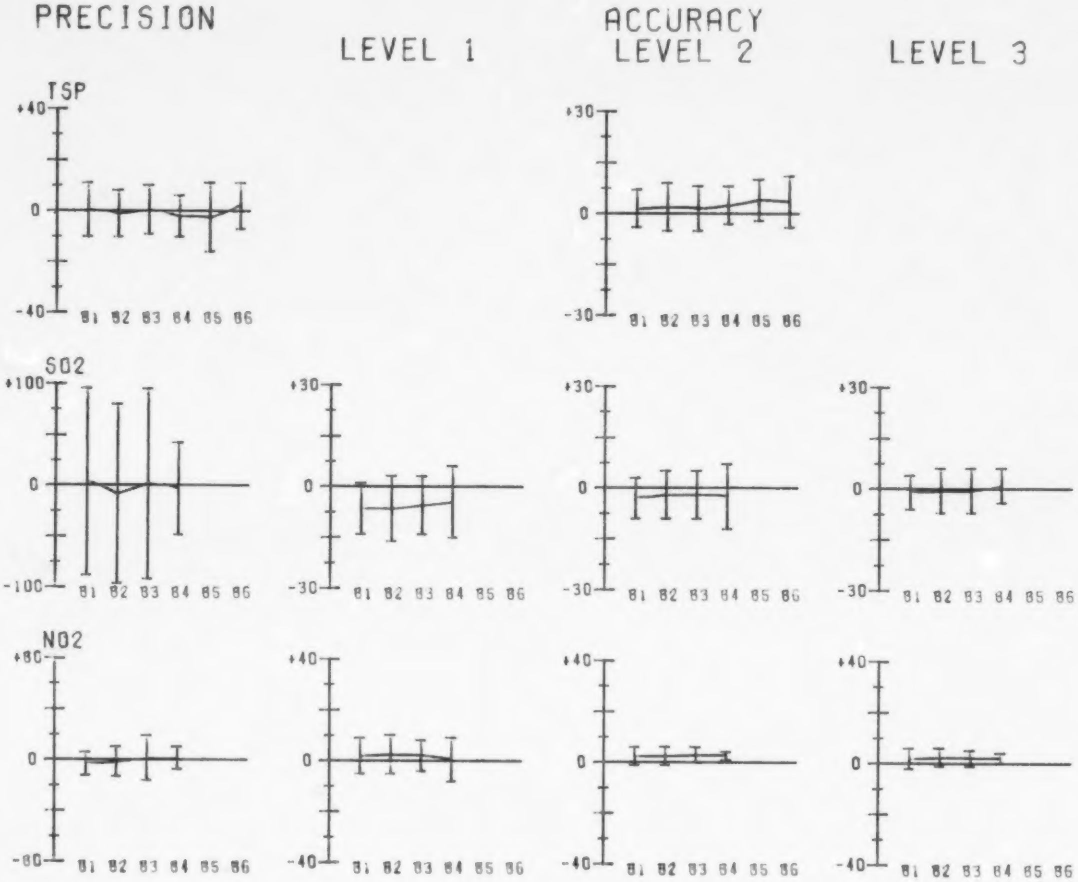
REG   : 04
STATE : 34 NORTH CAROLINA
REPORG : 003 NC, MECKLENBURG CO. DEPT. OF ENV. HEALTH

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

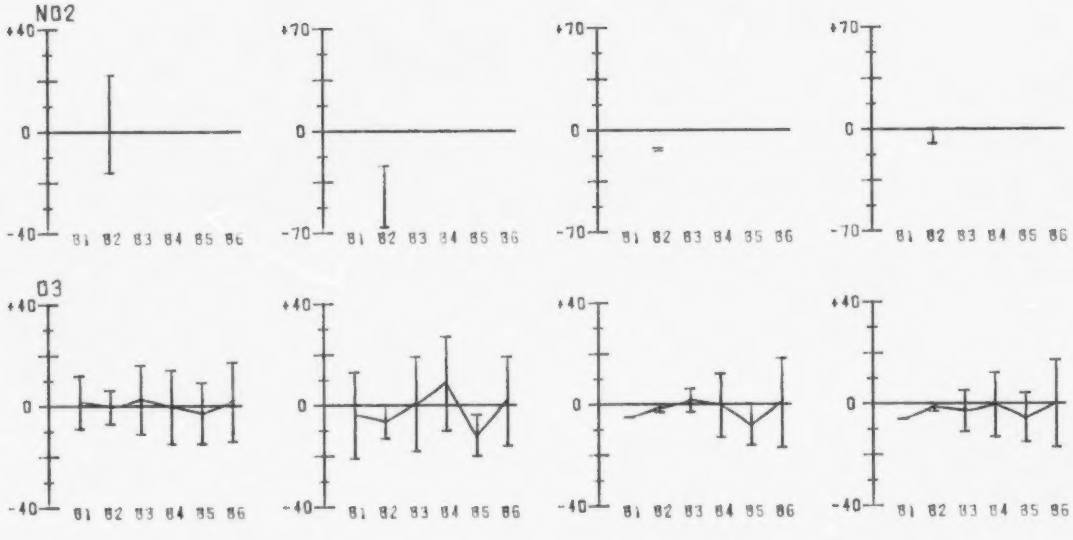
REG : 04
STATE : 34 NORTH CAROLINA
REPORG: 003 NC, MECKLENBURG CO. DEPT. OF ENV. HEALTH



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

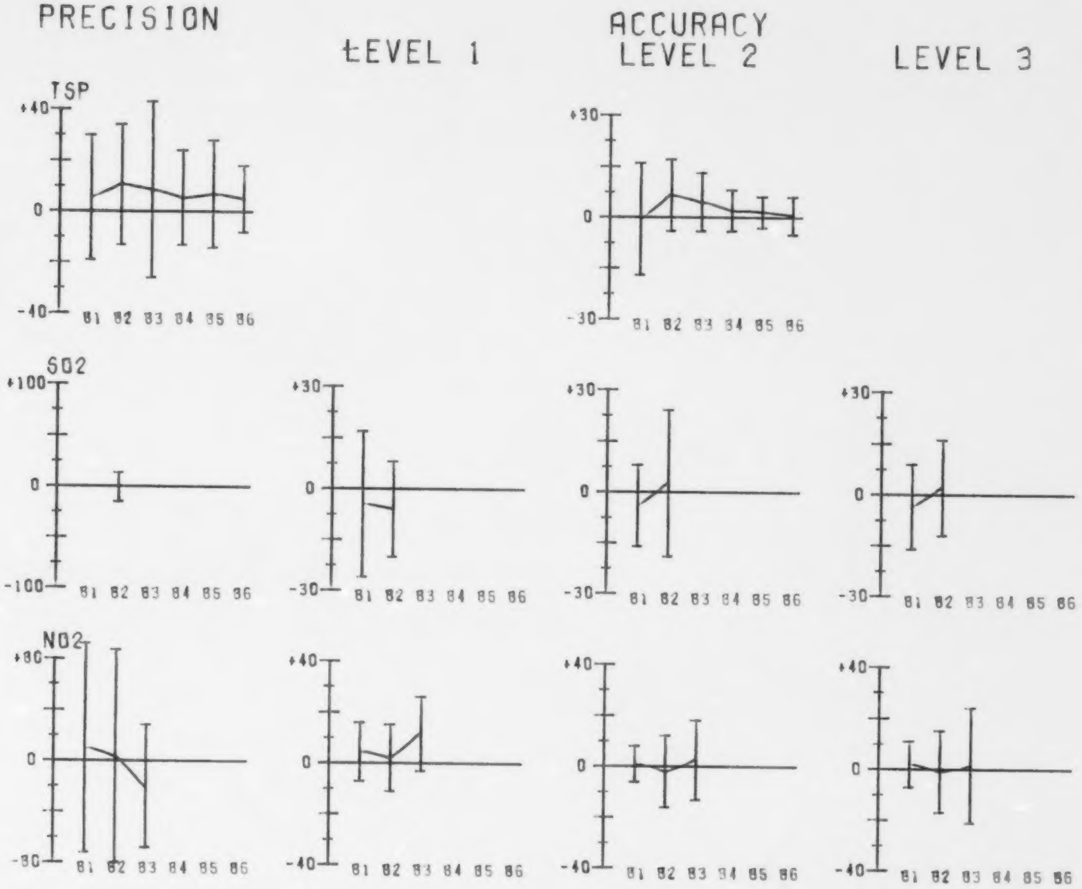
REG   : 04
STATE : 34 NORTH CAROLINA
REPORG: 004 NC, WESTERN REGIONAL AIR POLL. CONTROL

PRECISION
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04
STATE : 34 NORTH CAROLINA
REPORG: 004 NC, WESTERN REGIONAL AIR POLL. CONTROL

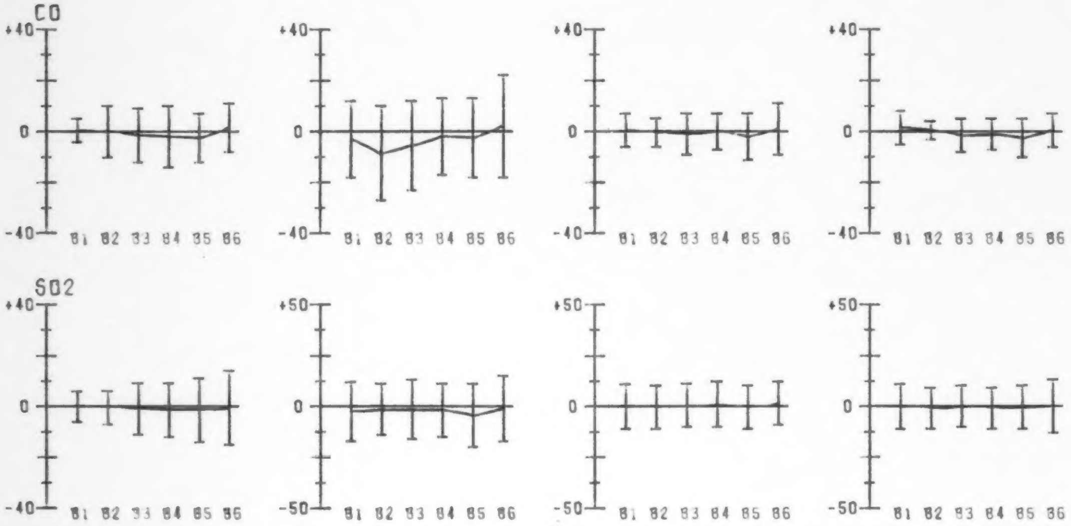


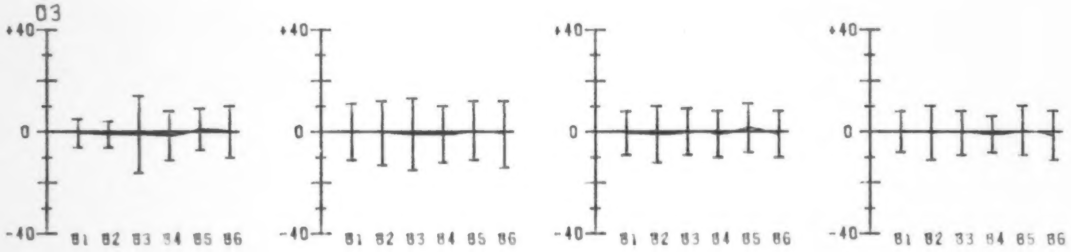
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 42 SOUTH CAROLINA
REPORG: 001 SC DEPARTMENT OF HEALTH & ENV. CONTROL

PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



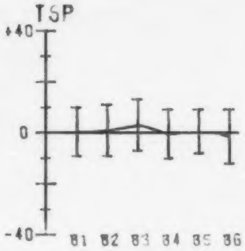


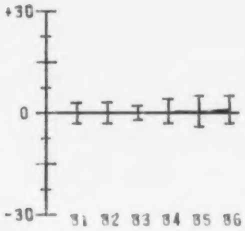
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

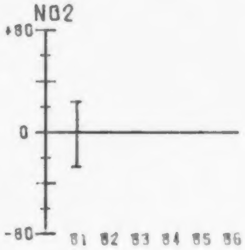
REG   : 04
STATE : 42   SOUTH CAROLINA
REPORG: 001 SC DEPARTMENT OF HEALTH & ENV. CONTROL

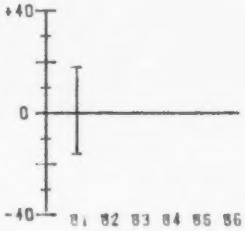
PRECISION   ACCURACY

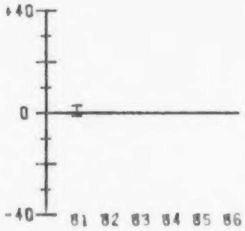
LEVEL 1   LEVEL 2   LEVEL 3

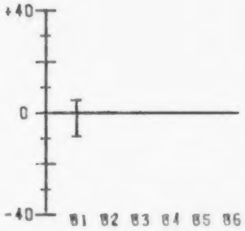


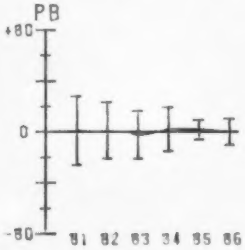


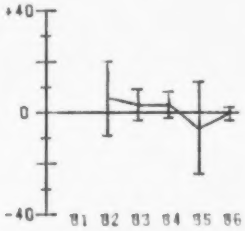


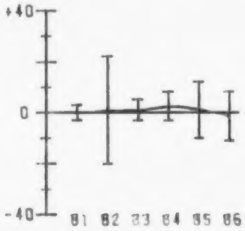








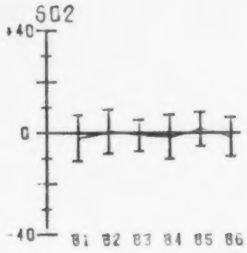


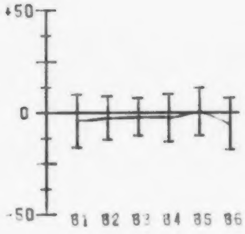


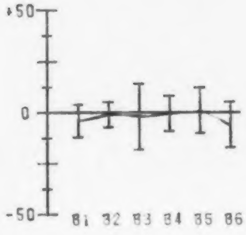
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

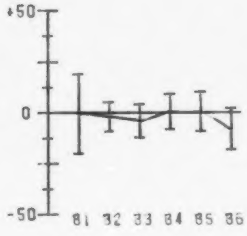
REG   : 04
STATE : 44 TENNESSEE
REPORG: 001 TENNESSEE DIV. OF AIR POLL. CONTROL

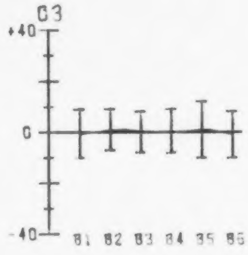
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3

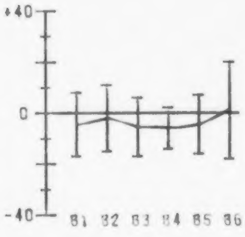


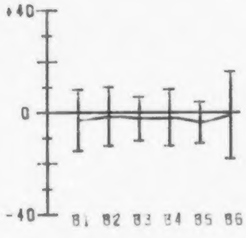


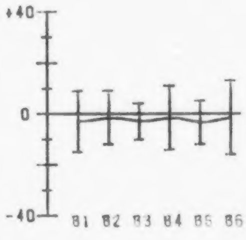










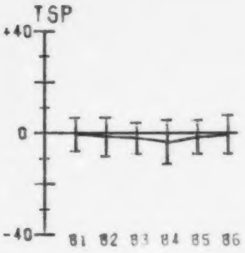


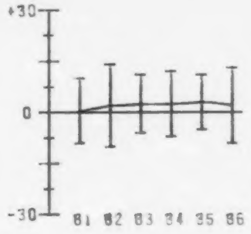
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

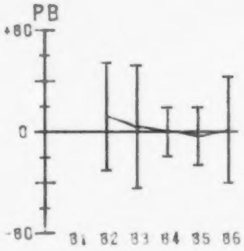
REG : 04
STATE : 44 TENNESSEE
REPORG: 001 TENNESSEE DIV. OF AIR POLL. CONTROL

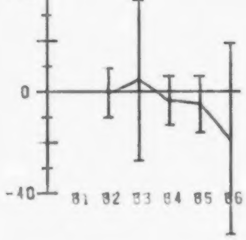
PRECISION

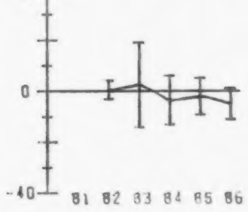
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3





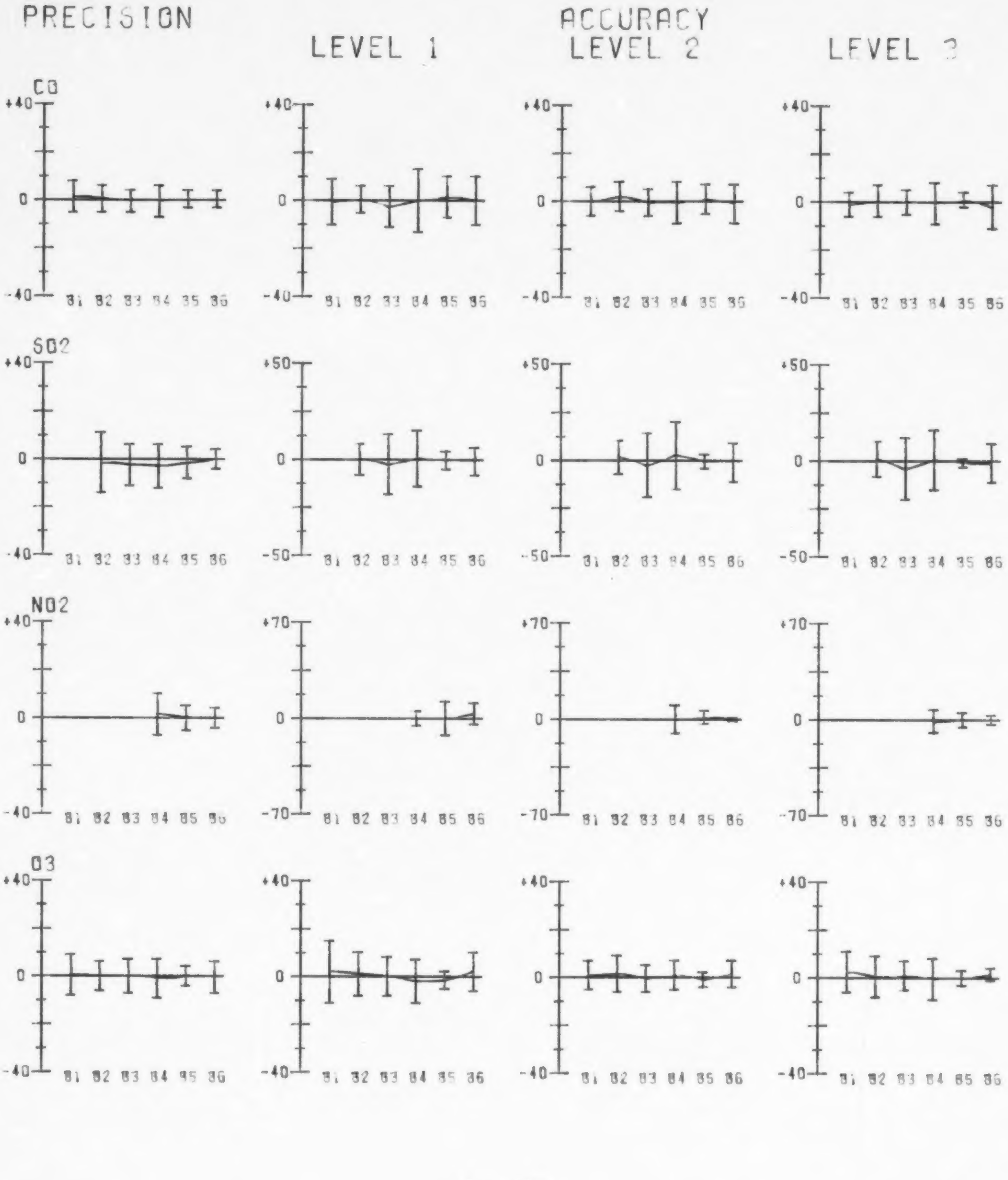






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 44 TENNESSEE
REPORG: 002 TN, MEMPHIS-SHELBY CO. HEALTH DEPARTMENT

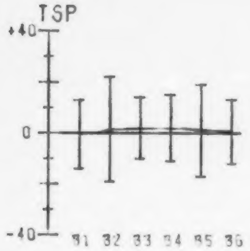


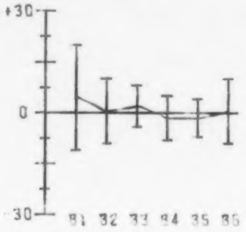
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

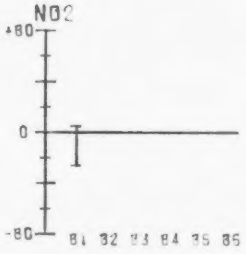
REG : 04
STATE : 44 TENNESSEE
REPORG: 002 TN, MEMPHIS-SHELBY CO. HEALTH DEPARTMENT

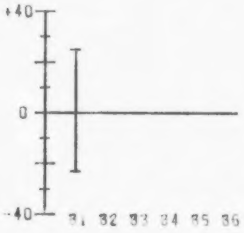
PRECISION

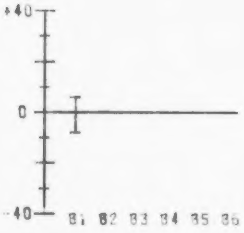
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

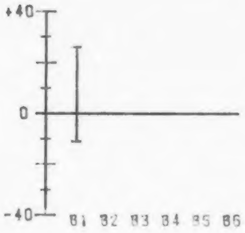


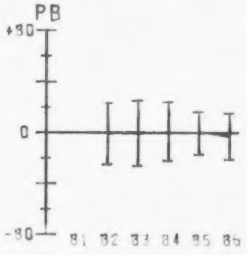


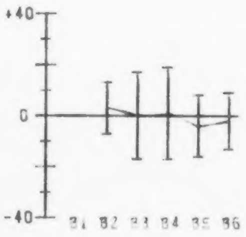


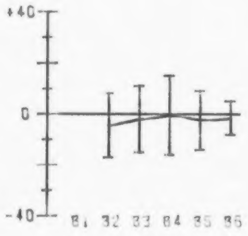






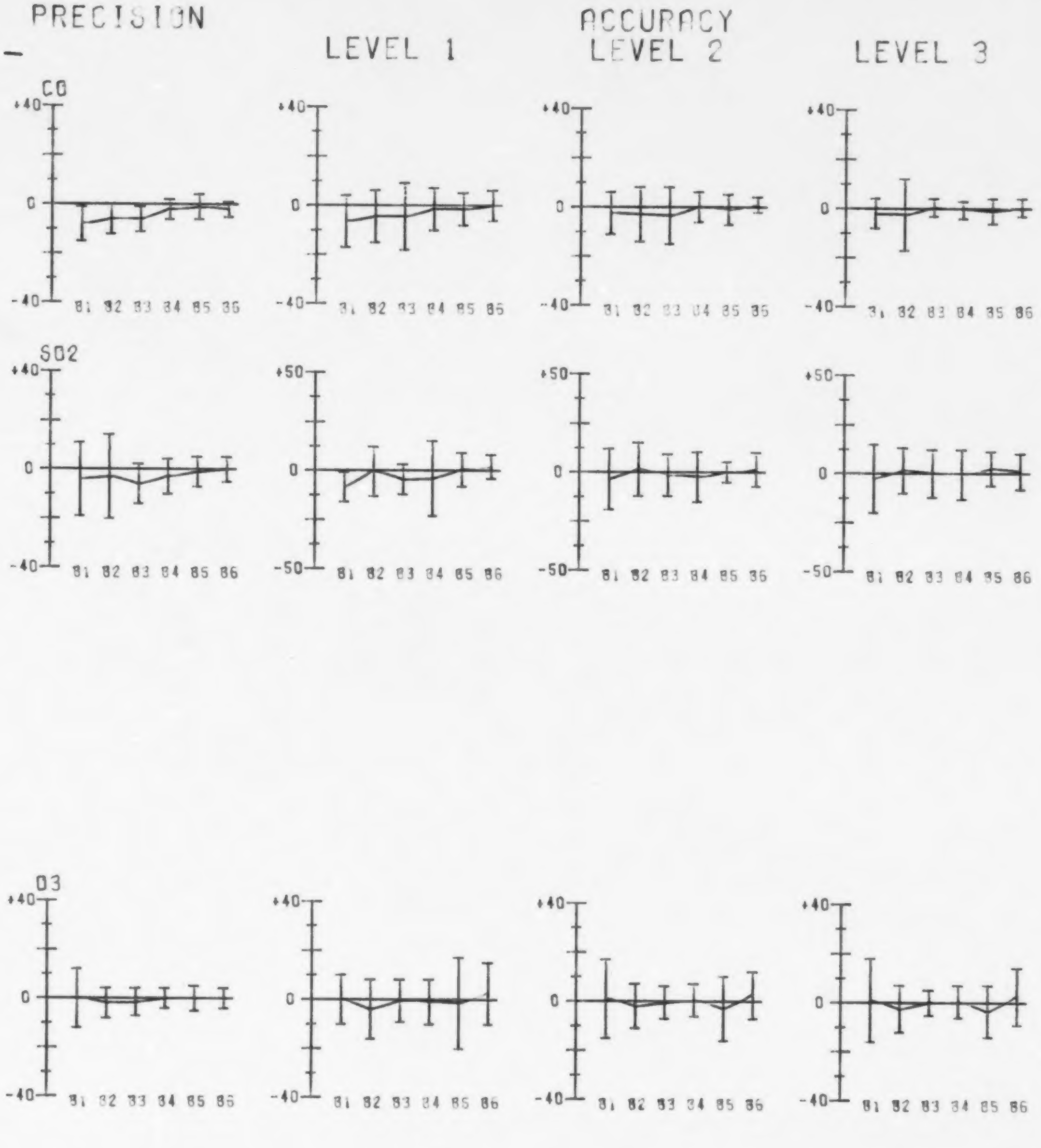






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04
STATE : 44 TENNESSEE
REPORG: 003 METRO HEALTH DEPT NASHVILLE-DAVIDSON CO.



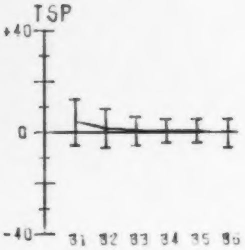
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

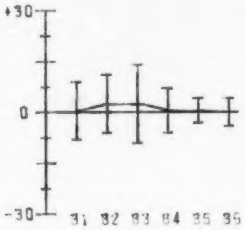
REG : 04
STATE : 44 TENNESSEE
REPORG: 003 METRO HEALTH DEPT NASHVILLE-DAVIDSON CO.

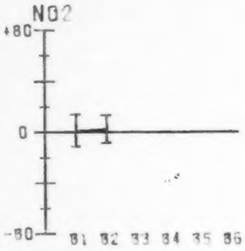
PRECISION

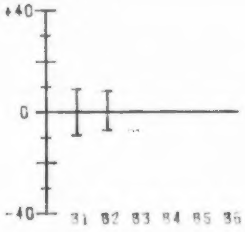
ACCURACY

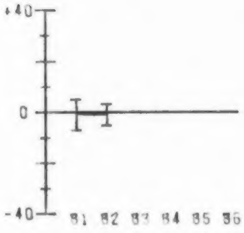
LEVEL 1 LEVEL 2 LEVEL 3

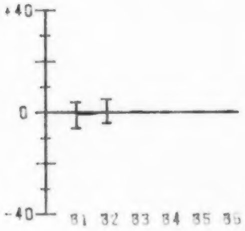


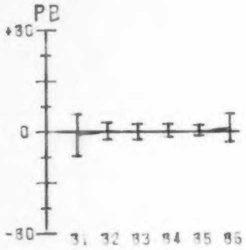


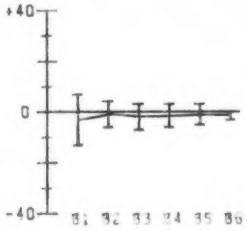


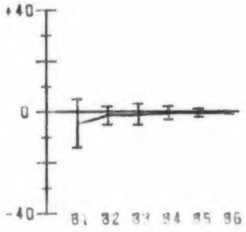










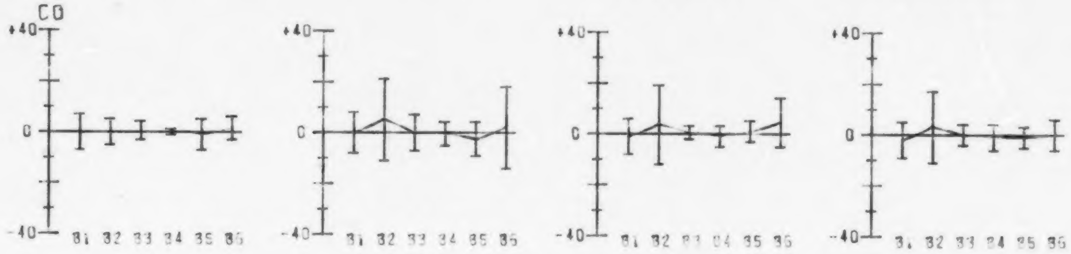


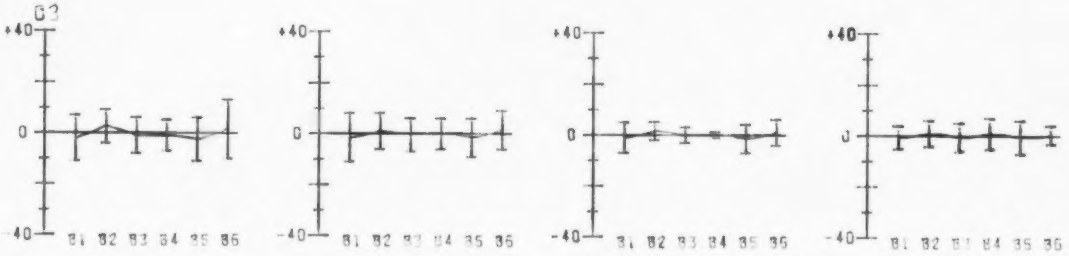
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 44   TENNESSEE
REPORG: 004 TN, KNOX COUNTY DEPT OF AIR POLL CONTROL

PRECISION   ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3





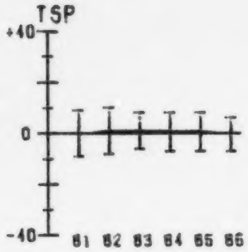
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

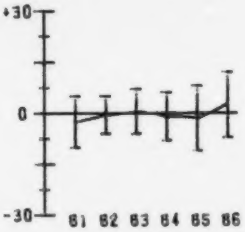
REG : 04
STATE : 44 TENNESSEE
REPORG: 004 TN, KNOX COUNTY DEPT OF AIR POLL CONTROL

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3





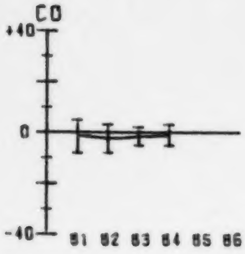
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

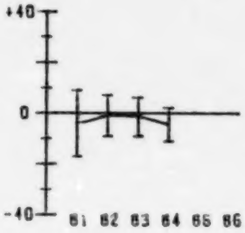
REG : 04
STATE : 44 TENNESSEE
REPORG: 005 TN, CHATTANOOGA-HAMILTON CO AIR POL CONT

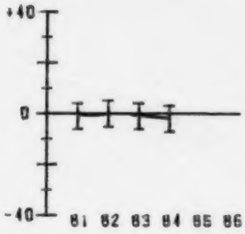
PRECISION

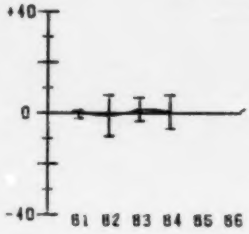
ACCURACY

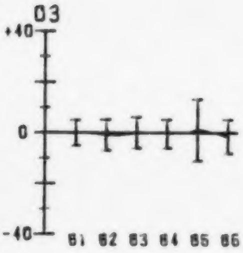
LEVEL 1 LEVEL 2 LEVEL 3

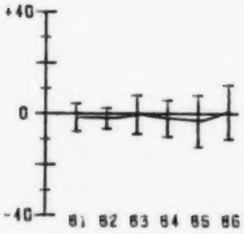


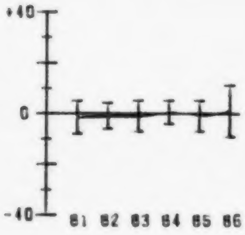


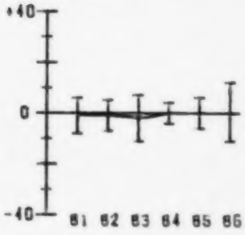












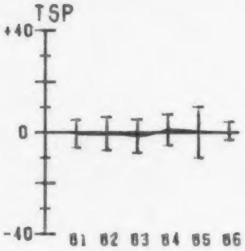
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

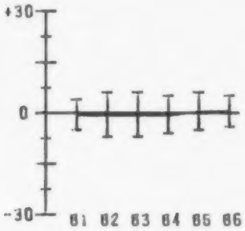
REG : 04
STATE : 44 TENNESSEE
REPORG: 005 TN, CHATTANOOGA-HAMILTON CO AIR POL CONT

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3

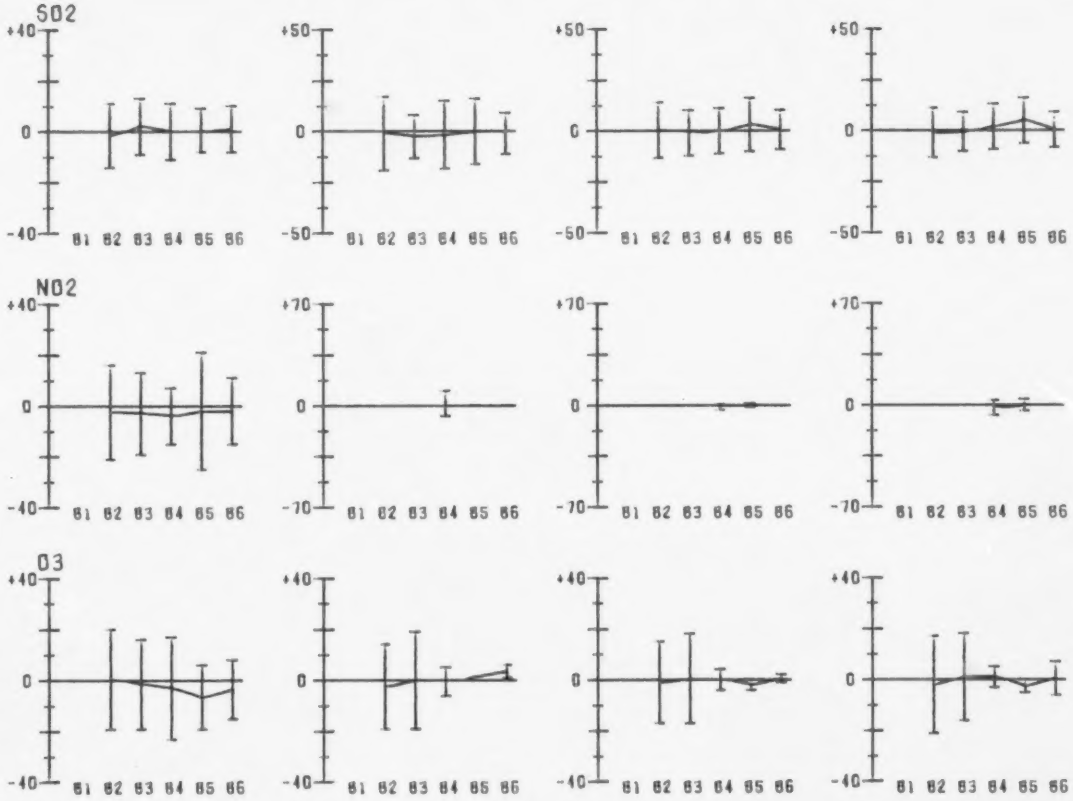




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 04
STATE : 44   TENNESSEE
REPORG : 006 TENNESSEE VALLEY AUTHORITY - TENNESSEE

PRECISION
ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



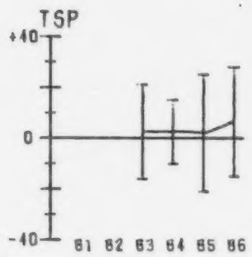
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

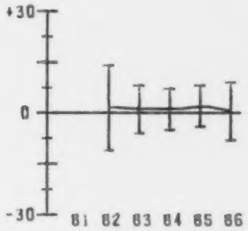
REG : 04
STATE : 44 TENNESSEE
REPORG : 006 TENNESSEE VALLEY AUTHORITY - TENNESSEE

PRECISION

ACCURACY

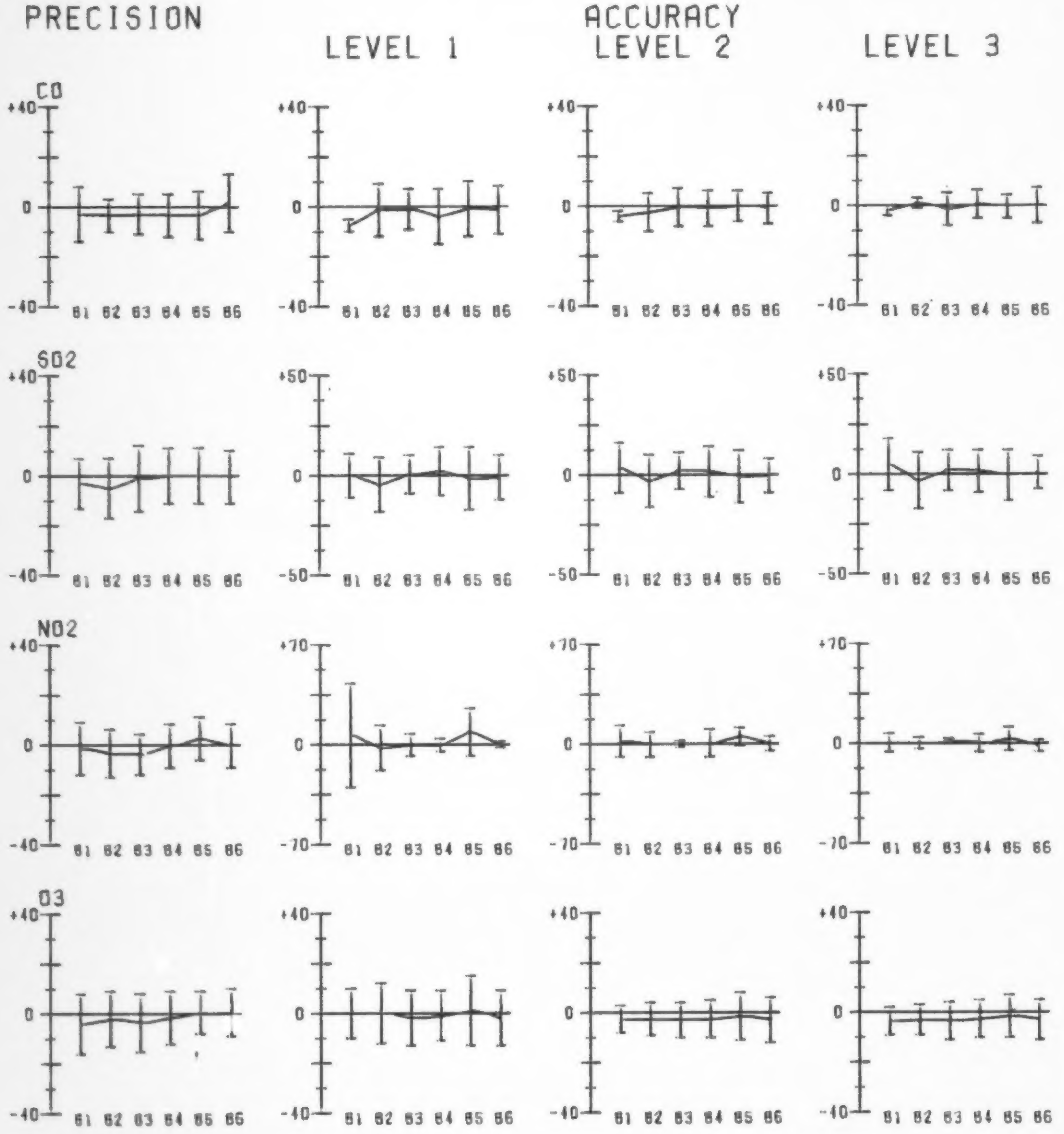
LEVEL 1 LEVEL 2 LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 14 ILLINOIS
REPORG: 001 DIV. OF AIR POLL. CONT., ILLINOIS EPA



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 05
STATE : 14 ILLINOIS
REPORG: 001 DIV. OF AIR POLL. CONT., ILLINOIS EPA

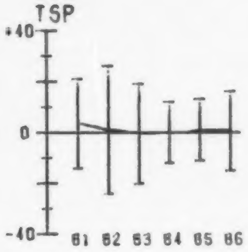
PRECISION

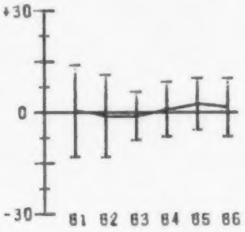
ACCURACY

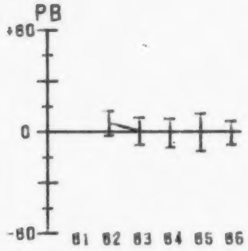
LEVEL 1

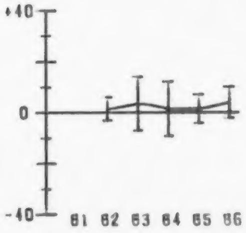
LEVEL 2

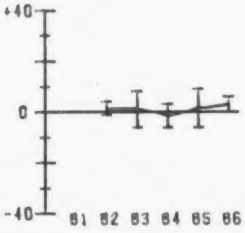
LEVEL 3







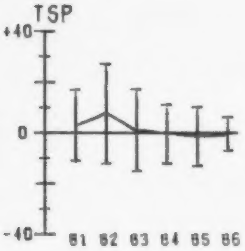


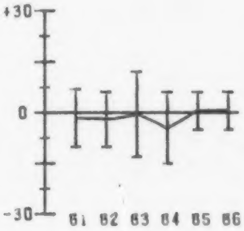


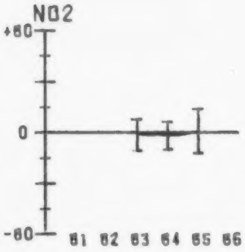
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

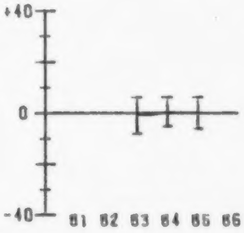
REG   : 05
STATE : 14 ILLINOIS
REPORG: 002 CHICAGO DEPT. OF CONSUMER SERVICES

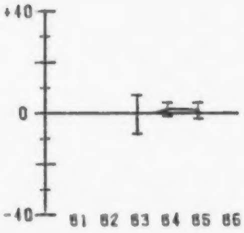
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3

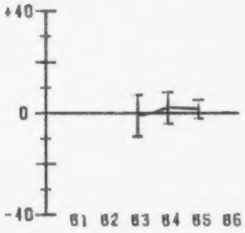


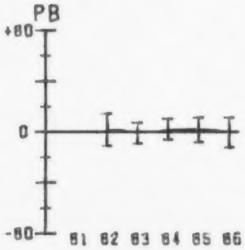


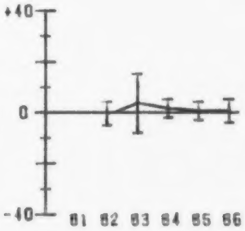


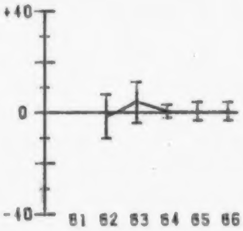










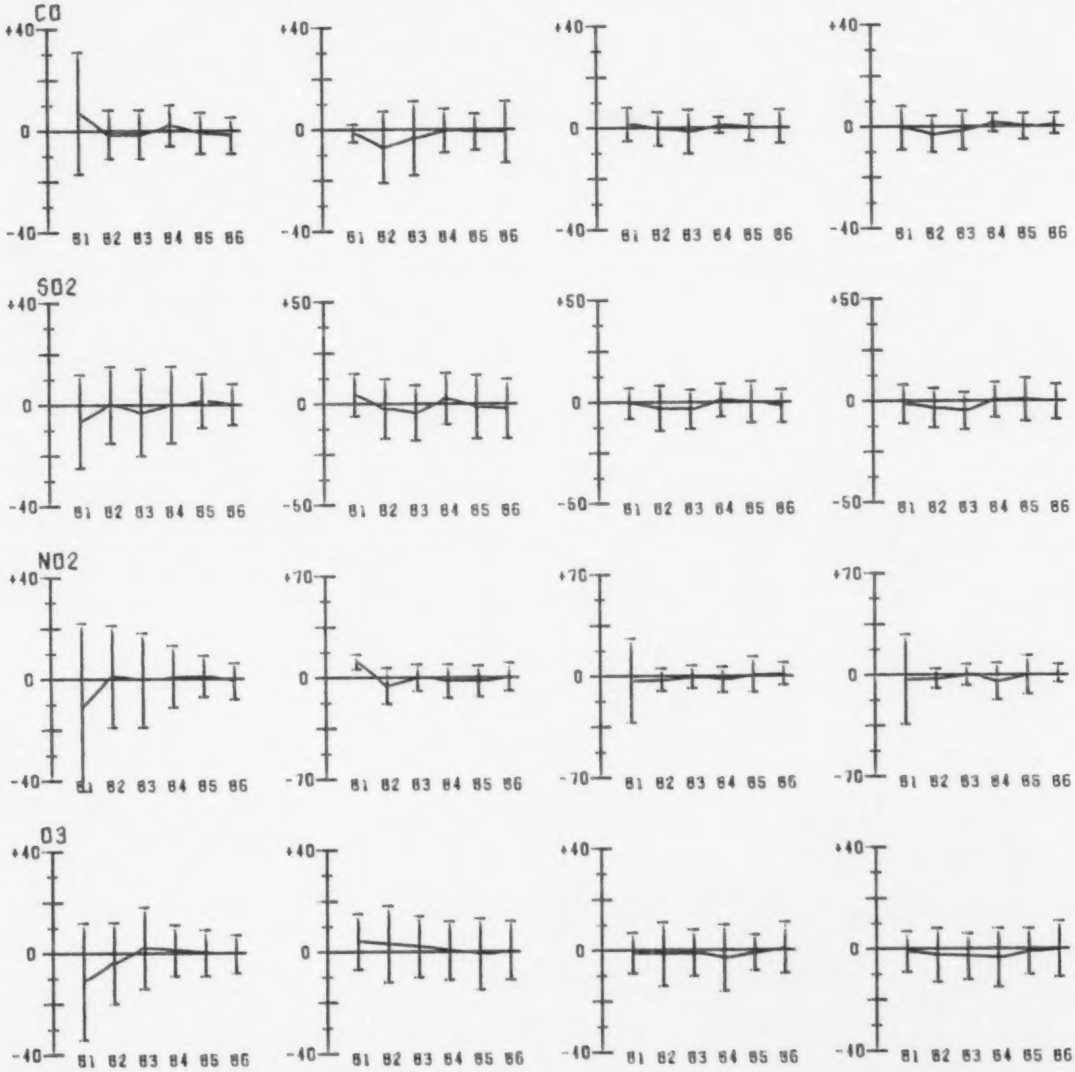


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 14 ILLINOIS
REPORG: 003 COOK COUNTY DEPT. OF ENVIRONMENTAL CONT

PRECISION

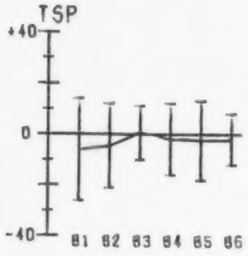
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

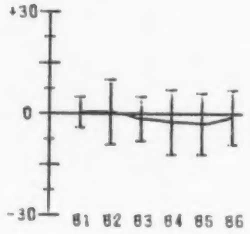


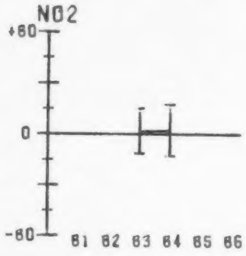
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

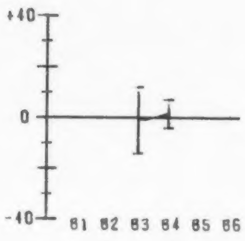
REG   : 05
STATE : 14 ILLINOIS
REPORG : 003 COOK COUNTY DEPT. OF ENVIRONMENTAL CONT

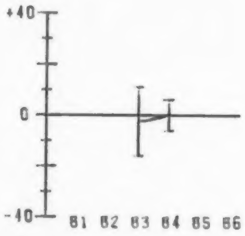
PRECISION | ACCURACY LEVEL 1 | ACCURACY LEVEL 2 | ACCURACY LEVEL 3

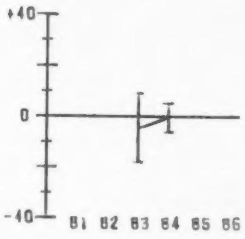


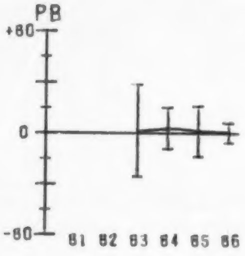


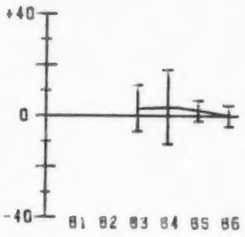


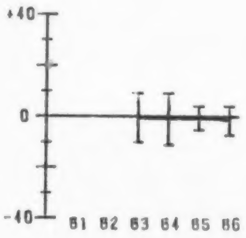






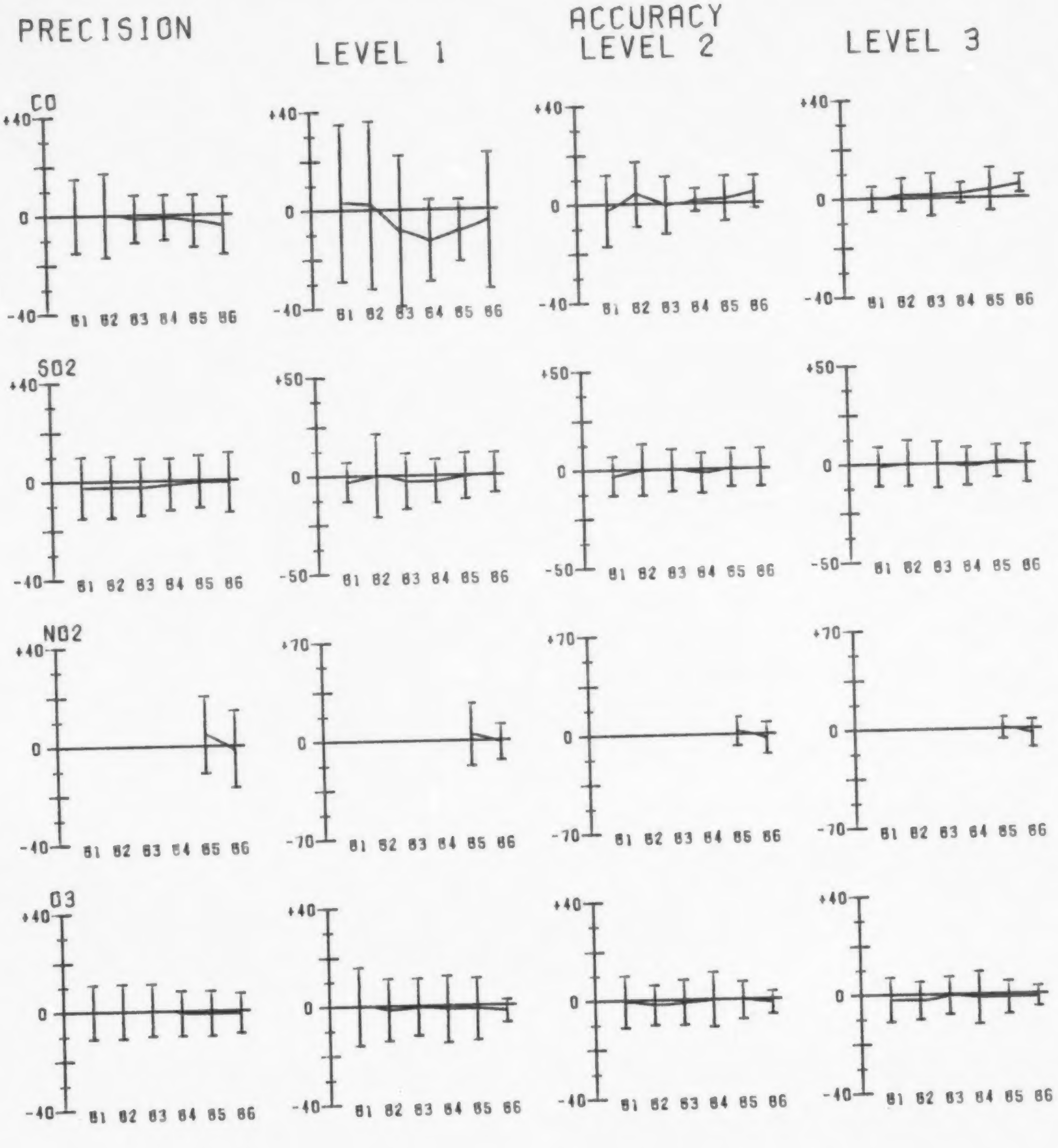






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 15 INDIANA
REPORG: 001 AIR POLL. CONT. DIV. INDIANA STATE



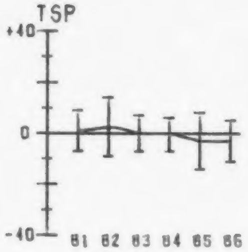
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

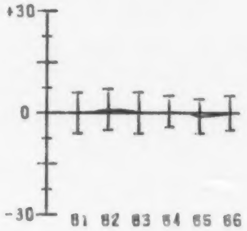
REG : 05
STATE : 15 INDIANA
REPORG: 001 AIR POLL. CONT. DIV. INDIANA STATE

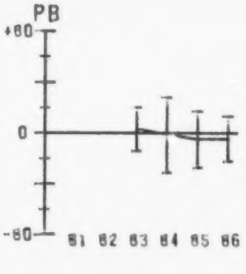
PRECISION

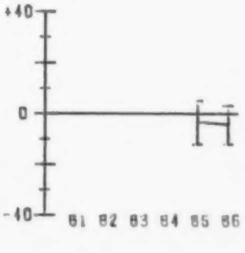
ACCURACY

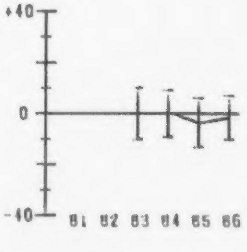
LEVEL 1 LEVEL 2 LEVEL 3





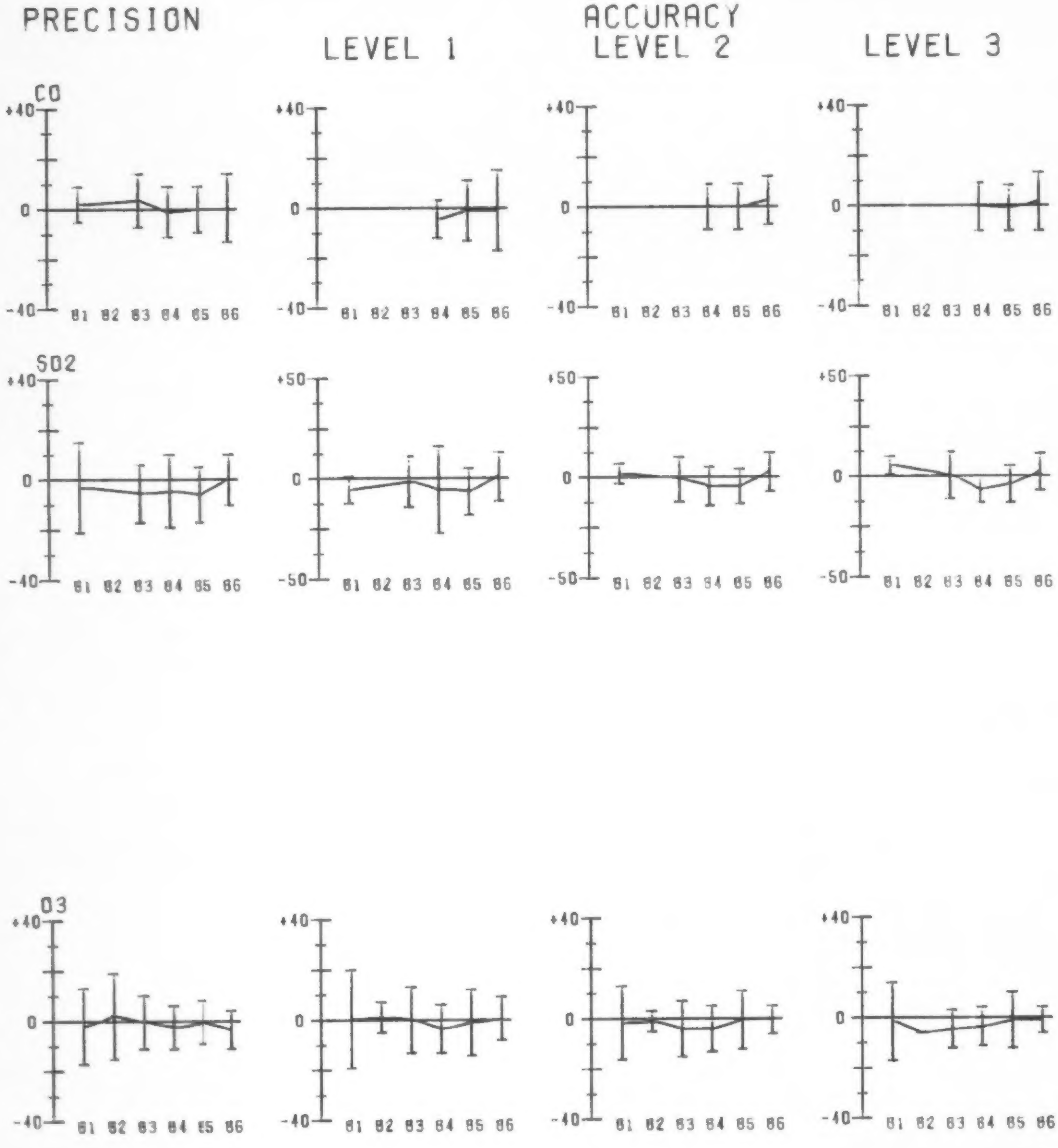






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

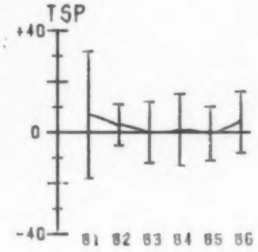
REG   : 05
STATE : 15   INDIANA
REPORG: 002 DIV. OF AIR POLL. CONT., EVANSVILLE

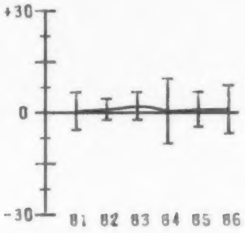


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 05
STATE : 15 INDIANA
REPORG: 002 DIV. OF AIR POLL. CONT., EVANSVILLE

PRECISION   ACCURACY
            LEVEL 1   LEVEL 2   LEVEL 3





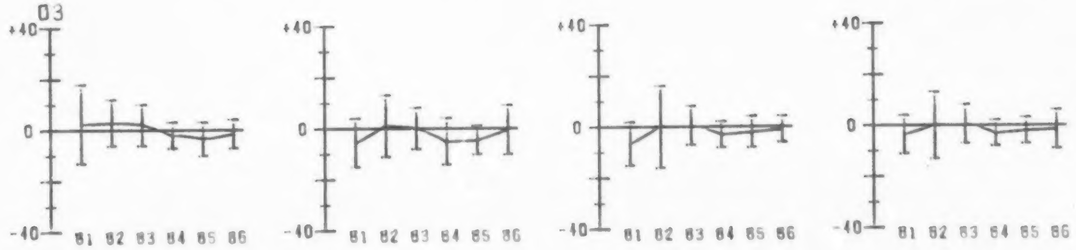
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 15 INDIANA
REPORG : 003 ST. JOSEPH COUNTY

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

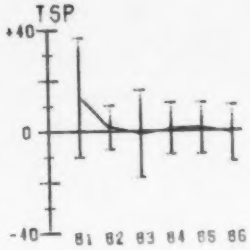
REG : 05
STATE : 15 INDIANA
REPORG: 003 ST. JOSEPH COUNTY

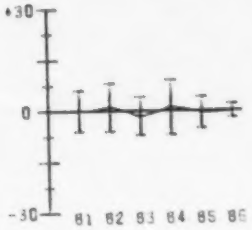
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

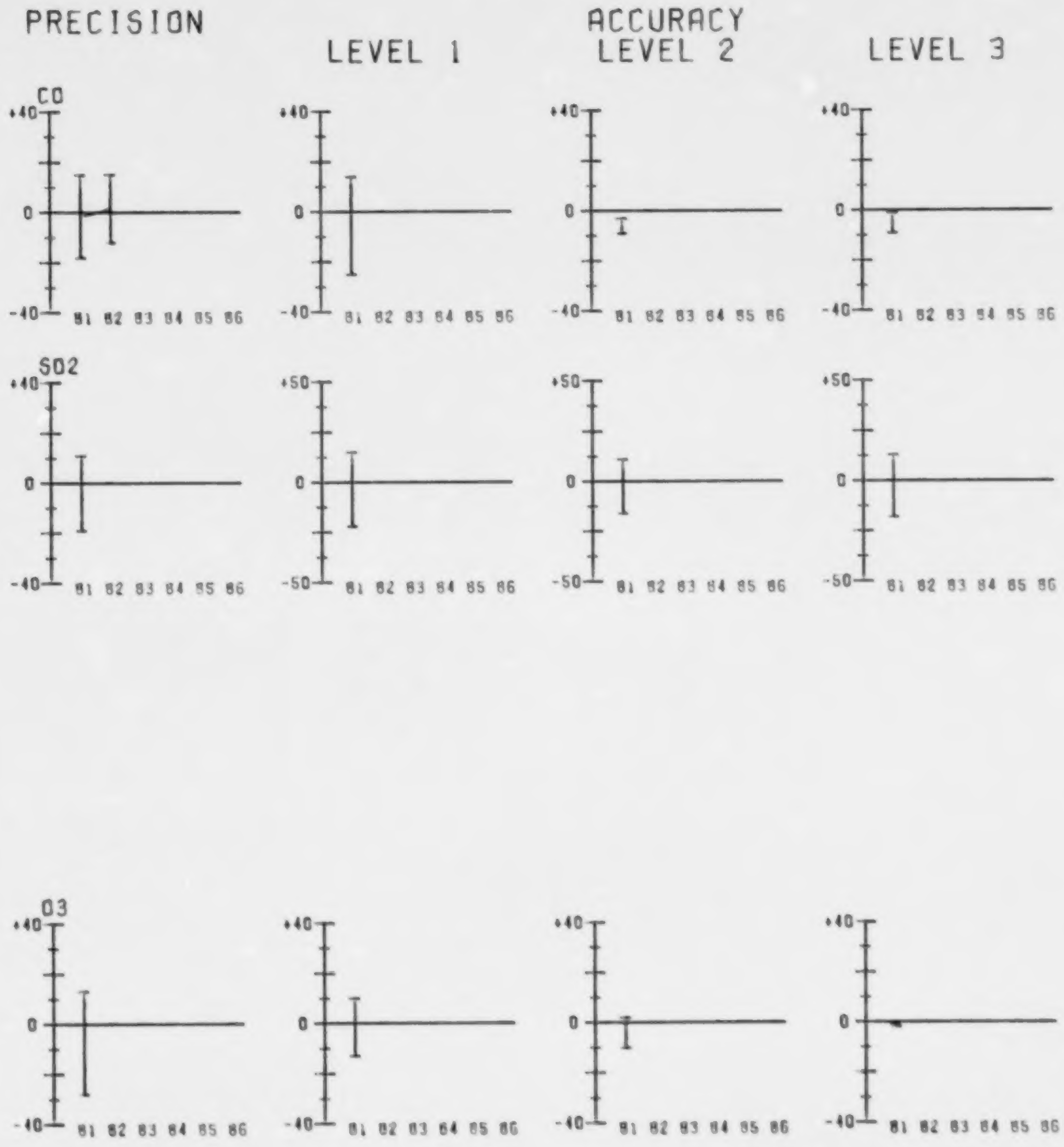
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 15 INDIANA
REPORG: 004 DIV. OF AIR POLLUTION CONTROL, GARY

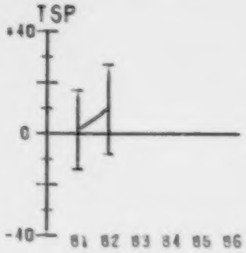


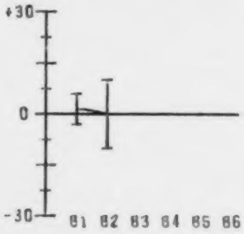
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 05
STATE : 15 INDIANA
REPORG : 004 DIV. OF AIR POLLUTION CONTROL, GARY

PRECISION

ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





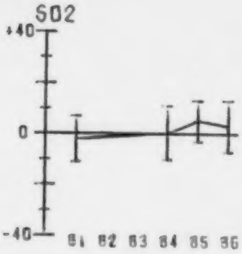
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

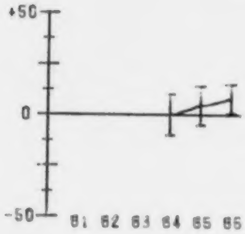
REG : 05
STATE : 15 INDIANA
REPORG : 005 AIR POLL. CONT. DIV., VIGO COUNTY

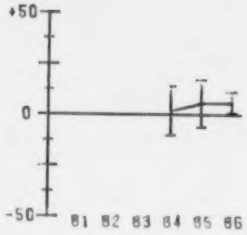
PRECISION

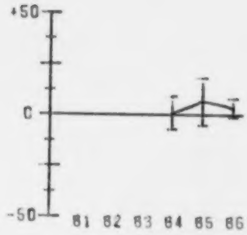
ACCURACY

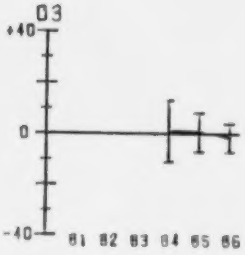
LEVEL 1 LEVEL 2 LEVEL 3

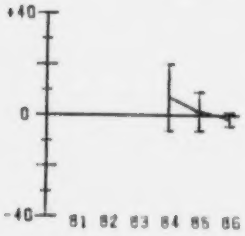


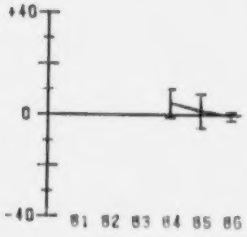


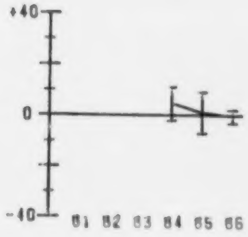












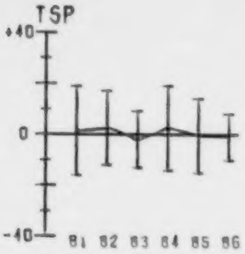
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

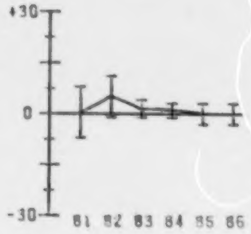
REG   : 05
STATE : 15 INDIANA
REPORG : 005 AIR POLL. CONT. DIV., VIGO COUNTY

PRECISION

ACCURACY

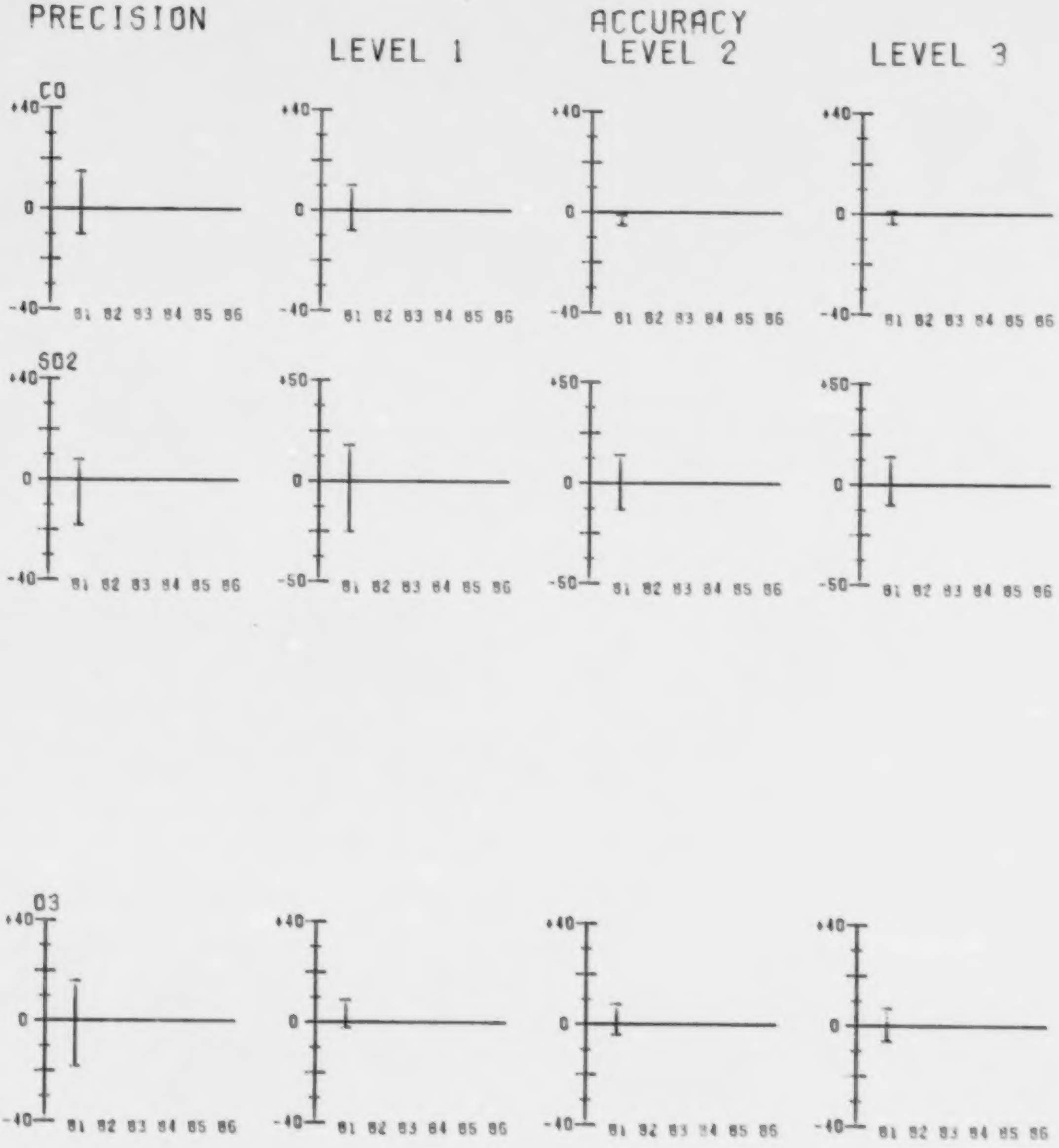
LEVEL 1   LEVEL 2   LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

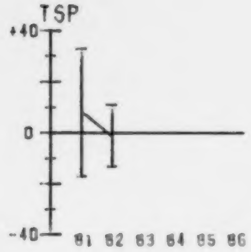
REG   : 05
STATE : 15   INDIANA
REPORG: 006 DIV. OF AIR QUALITY, EAST CHICAGO

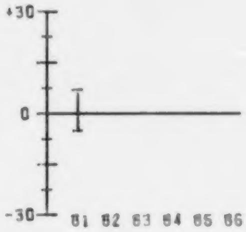


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 05
STATE : 15 INDIANA
REPORG: 006 DIV. OF AIR QUALITY, EAST CHICAGO

PRECISION | | ACCURACY |
--- | --- | --- | ---
| LEVEL 1 | LEVEL 2 | LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 15   INDIANA
REPORG : 007 AIR POLL. CONT. DIV.. HAMMOND

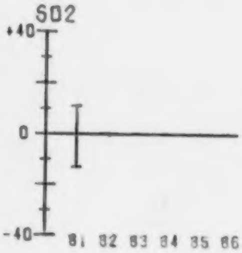
PRECISION

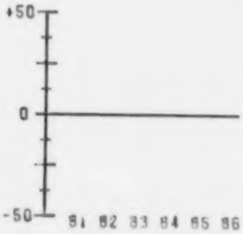
ACCURACY

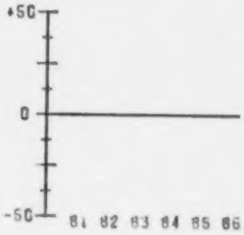
LEVEL 1

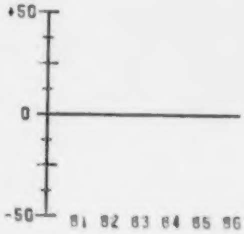
LEVEL 2

LEVEL 3









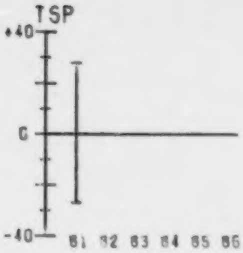
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

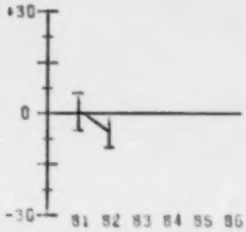
REG   : 05
STATE : 15 INDIANA
REPORG : 007 AIR POLL. CONT. DIV., HAMMOND

PRECISION

ACCURACY

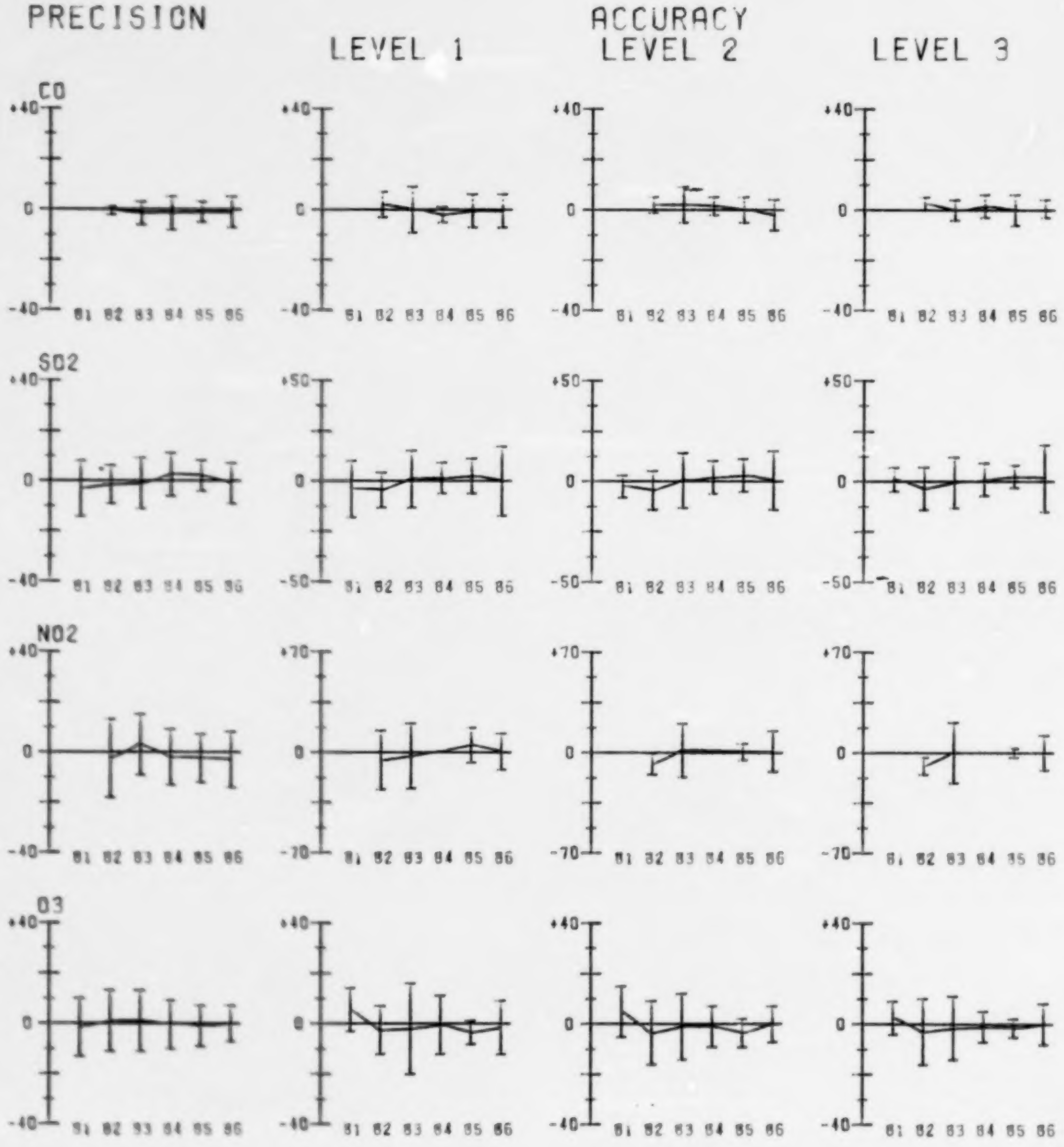
LEVEL 1   LEVEL 2   LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 15   INDIANA
REPORG : 008 INDIANAPOLIS APC DIVISION



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 05
STATE : 15 INDIANA
REPORG : 008 INDIANAPOLIS APC DIVISION

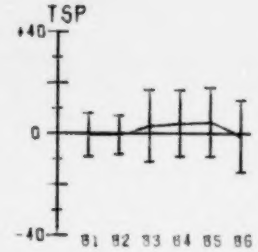
PRECISION

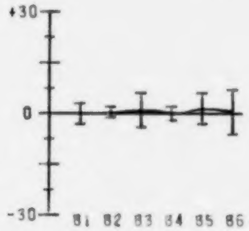
ACCURACY

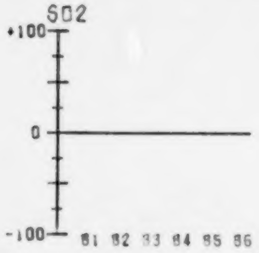
LEVEL 1

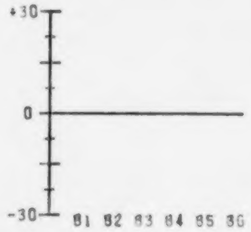
LEVEL 2

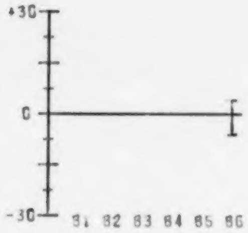
LEVEL 3

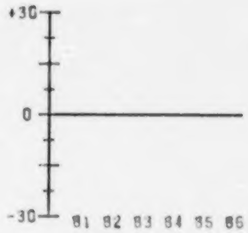


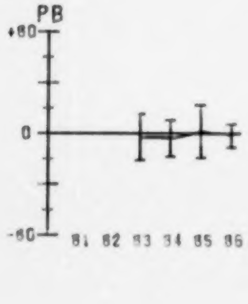


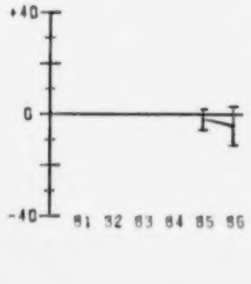


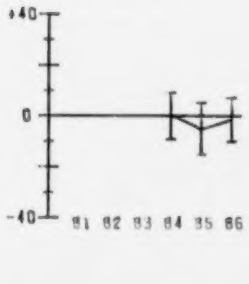












95% PROBABILITY LIMITS 81-86
MANUAL METHODS

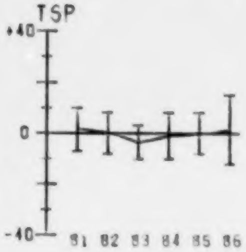
REG   : 05
STATE : 15 INDIANA
REPORG: 009 ANDERSON LOCAL AGENCY

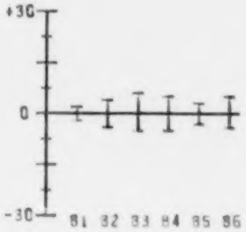
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

LEVEL 3

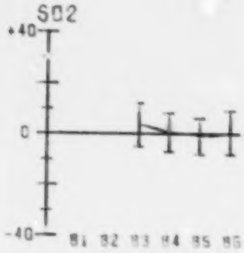


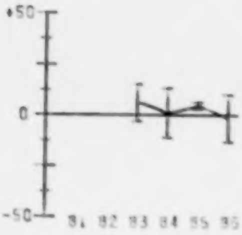


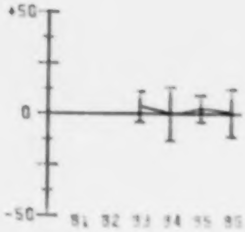
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS
REG : 05
STATE : 15 INDIANA
REPORG: 010 PORTER COUNTY HEALTH DEPARTMENT

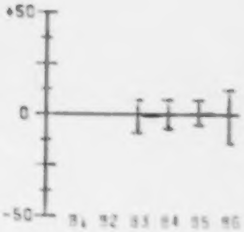
PRECISION

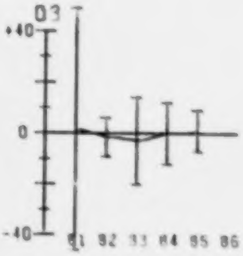
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

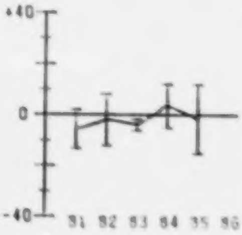


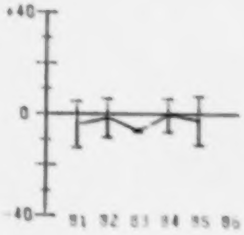


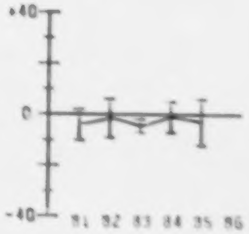








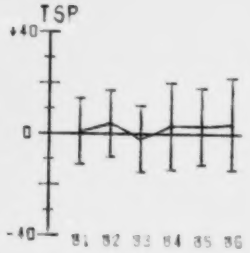


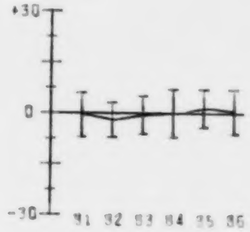


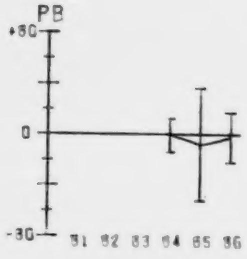
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

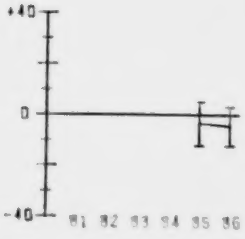
REG   : 05
STATE : 15 INDIANA
REPORG : 010 PORTER COUNTY HEALTH DEPARTMENT

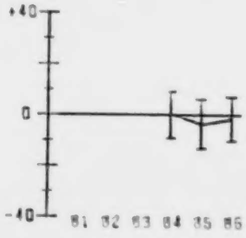
PRECISION | ACCURACY
LEVEL 1 | LEVEL 2 | LEVEL 3











Reproduced from
best available copy.

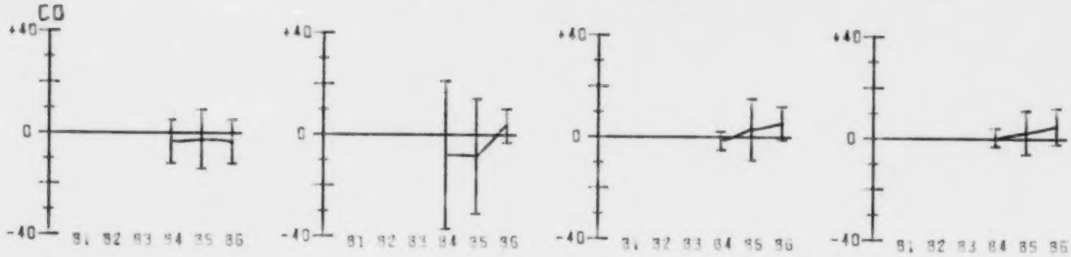
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

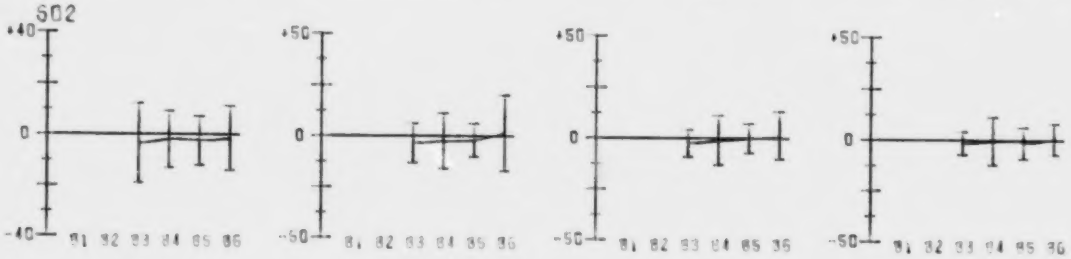
REG   : 05
STATE : 15 INDIANA
REPORG : 100 LAKE COUNTY CONSOLDTD A Q MONIT WRK GRP

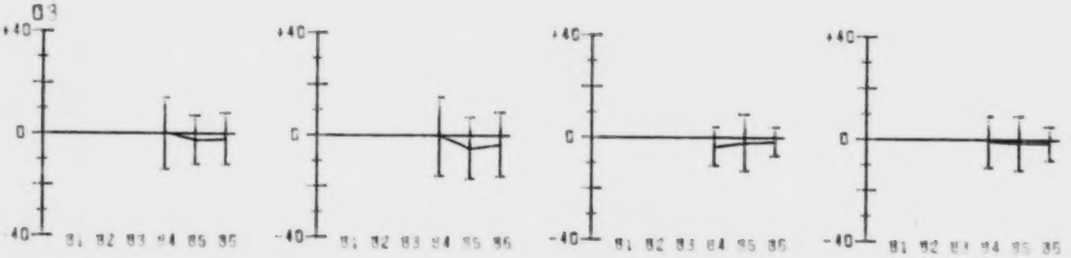
PRECISION

ACCURACY

LEVEL 1 | LEVEL 2 | LEVEL 3



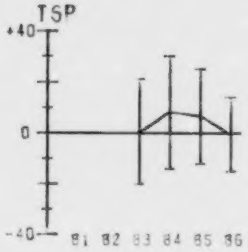


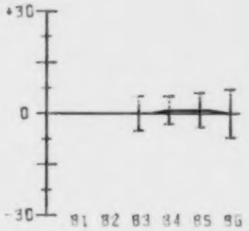


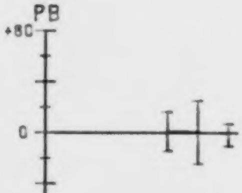
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

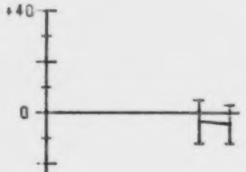
REG : 05
STATE : 15 INDIANA
REPORG: 100 LAKE COUNTY CONSOLDTD A Q MONIT WRK GRP

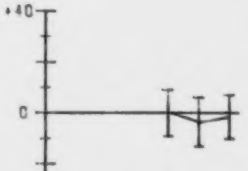
PRECISION LEVEL 1 ACCURACY LEVEL 2 LEVEL 3











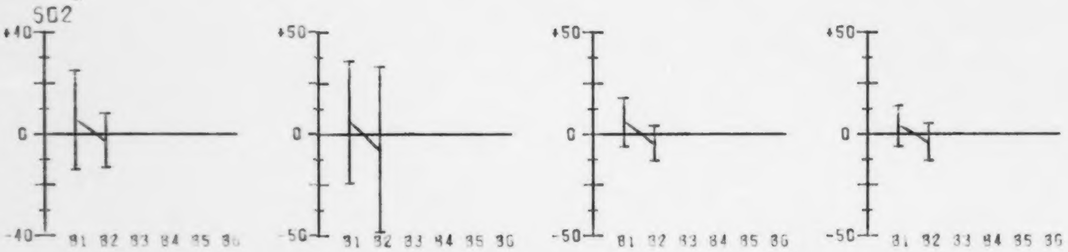
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 15 INDIANA
REPORG: 101 PUBLIC SERVICE OF INDIANA

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

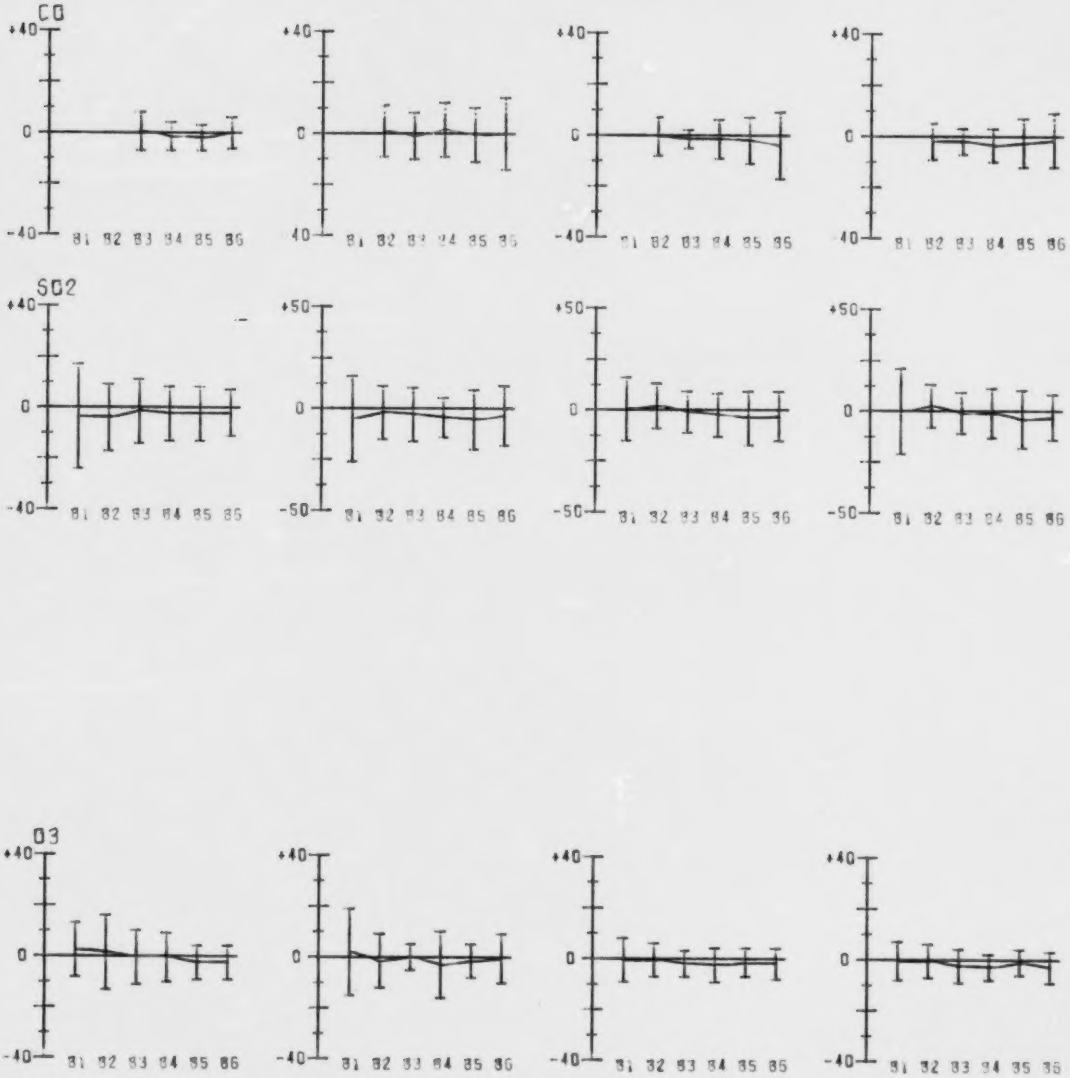
REG : 05
STATE : 15 INDIANA
REPORG: 101 PUBLIC SERVICE OF INDIANA

PRECISION	ACCURACY LEVEL 1	LEVEL 2	LEVEL 3

95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 23 MICHIGAN
REPORG: 001 AIR QUAL. DIV., MI. DEPT. OF NAT. RES.

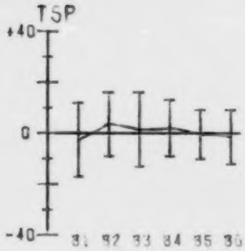
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3

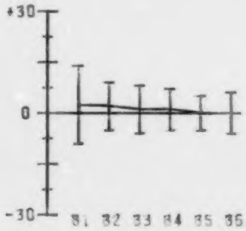


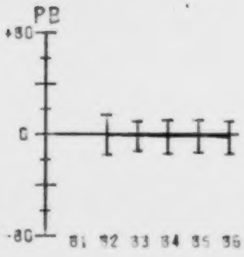
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

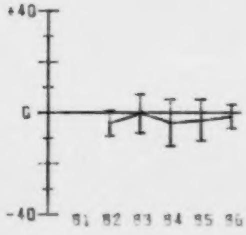
REG   : 05
STATE : 23 MICHIGAN
REPORG: 001 AIR QUAL. DIV., MI. DEPT. OF NAT. RES.

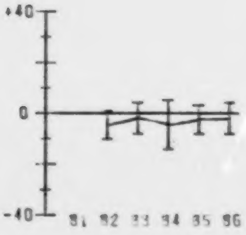
PRECISION | ACCURACY
LEVEL 1 | LEVEL 2 | LEVEL 3





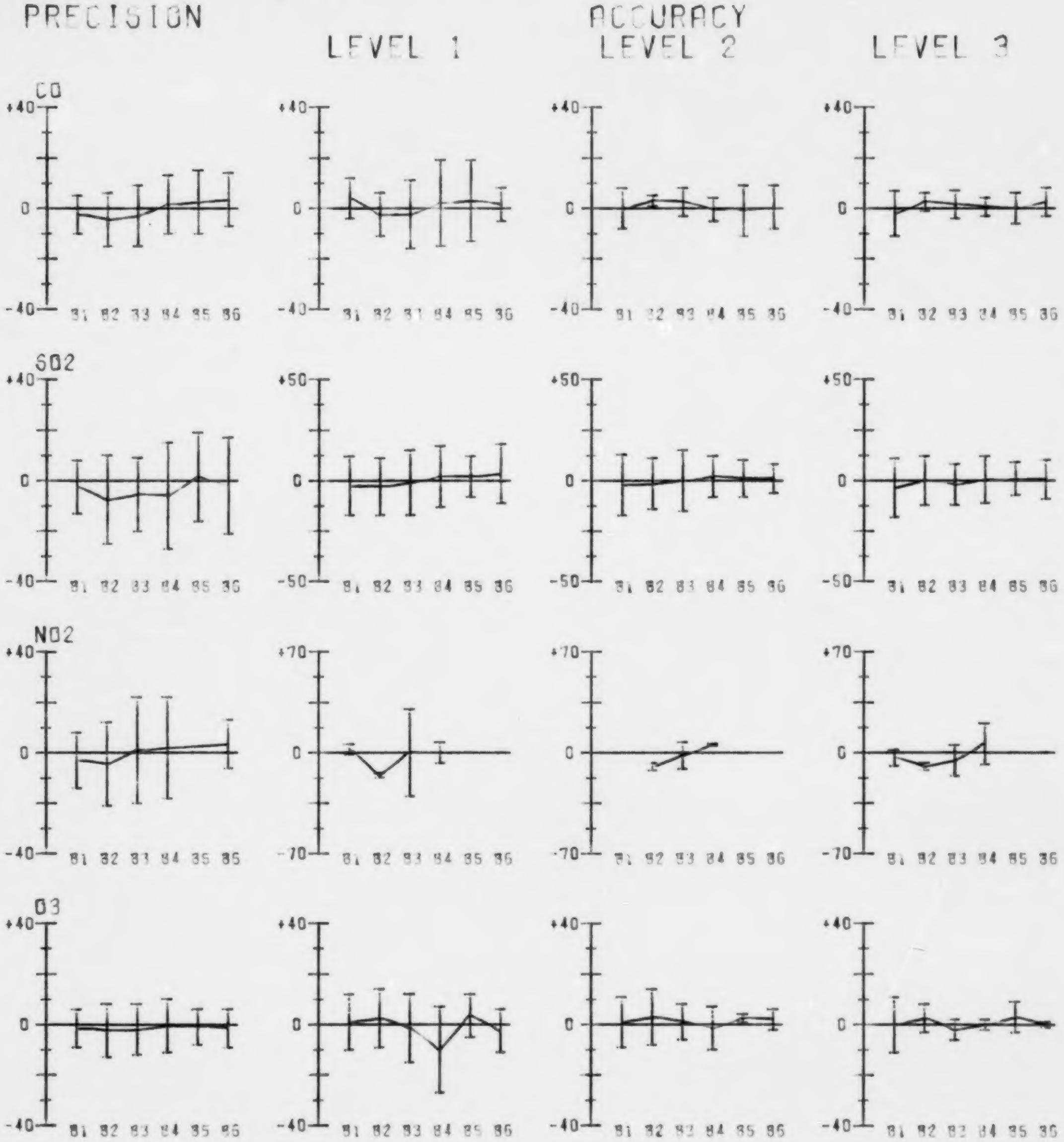






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 23 MICHIGAN
REPORG: 002 AIR POLL. CONT. DIV., WAYNE COUNTY



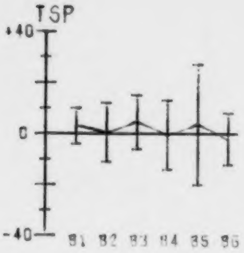
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

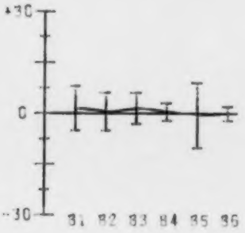
REG : 05
STATE : 23 MICHIGAN
REPORG: 002 AIR POLL. CONT. DIV., WAYNE COUNTY

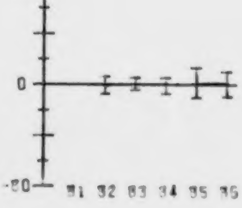
PRECISION

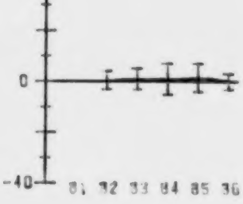
ACCURACY

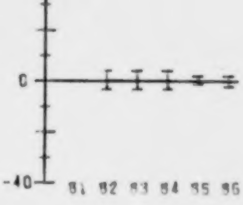
LEVEL 1 LEVEL 2 LEVEL 3





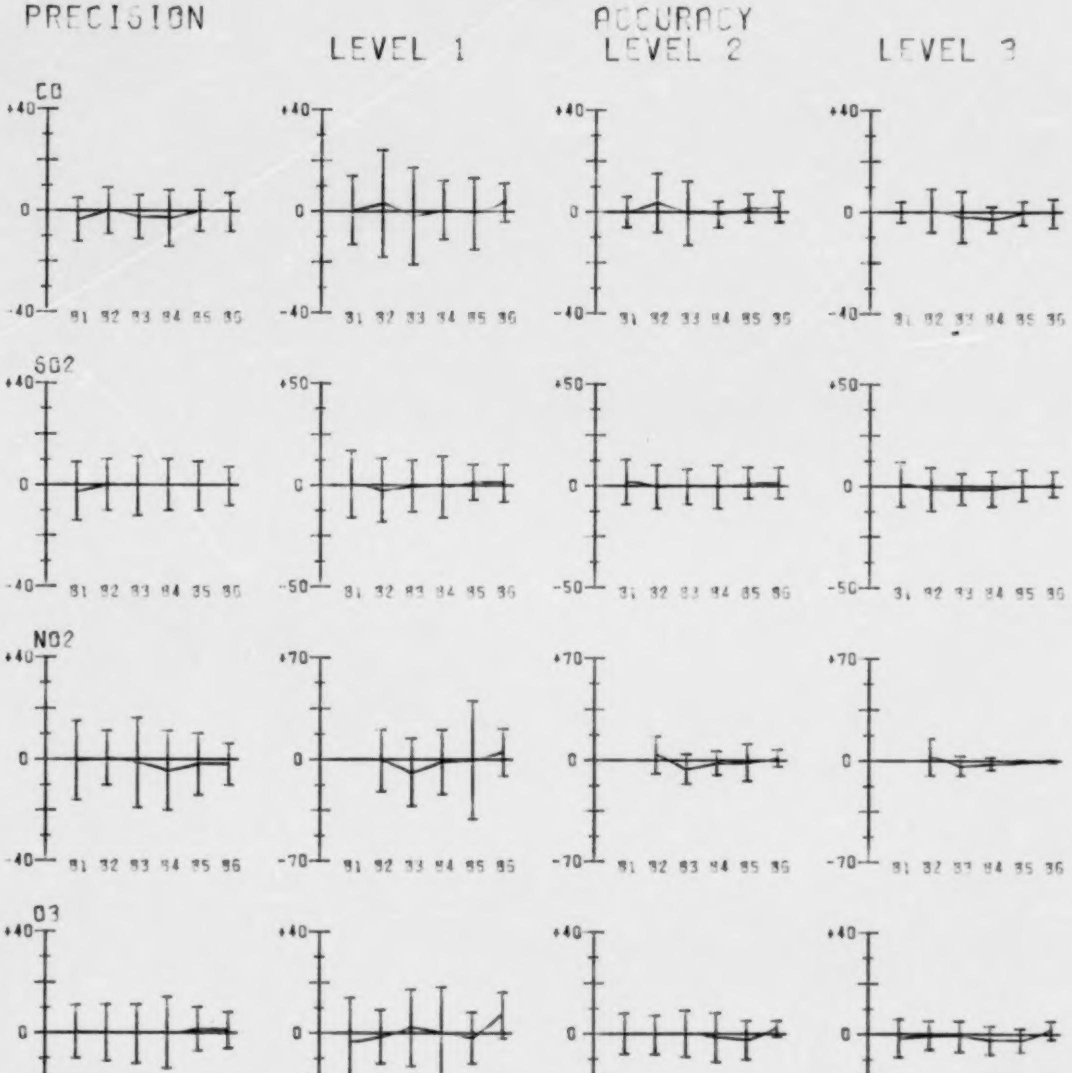






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 24   MINNESOTA
REPORG: 001 MINNESOTA POLL. CONT. AGENCY, AIR MO



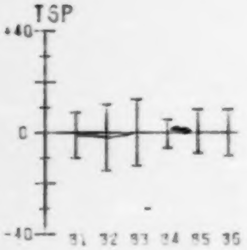
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

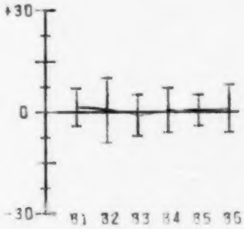
REG   : 05
STATE : 24   MINNESOTA
REPORG: 001 MINNESOTA POLL. CONT. AGENCY, AIR MO

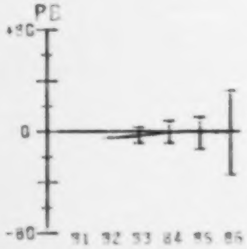
PRECISION

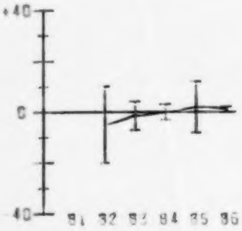
ACCURACY

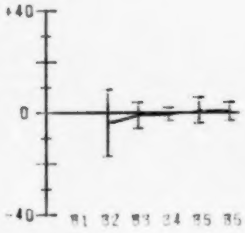
LEVEL 1   LEVEL 2   LEVEL 3





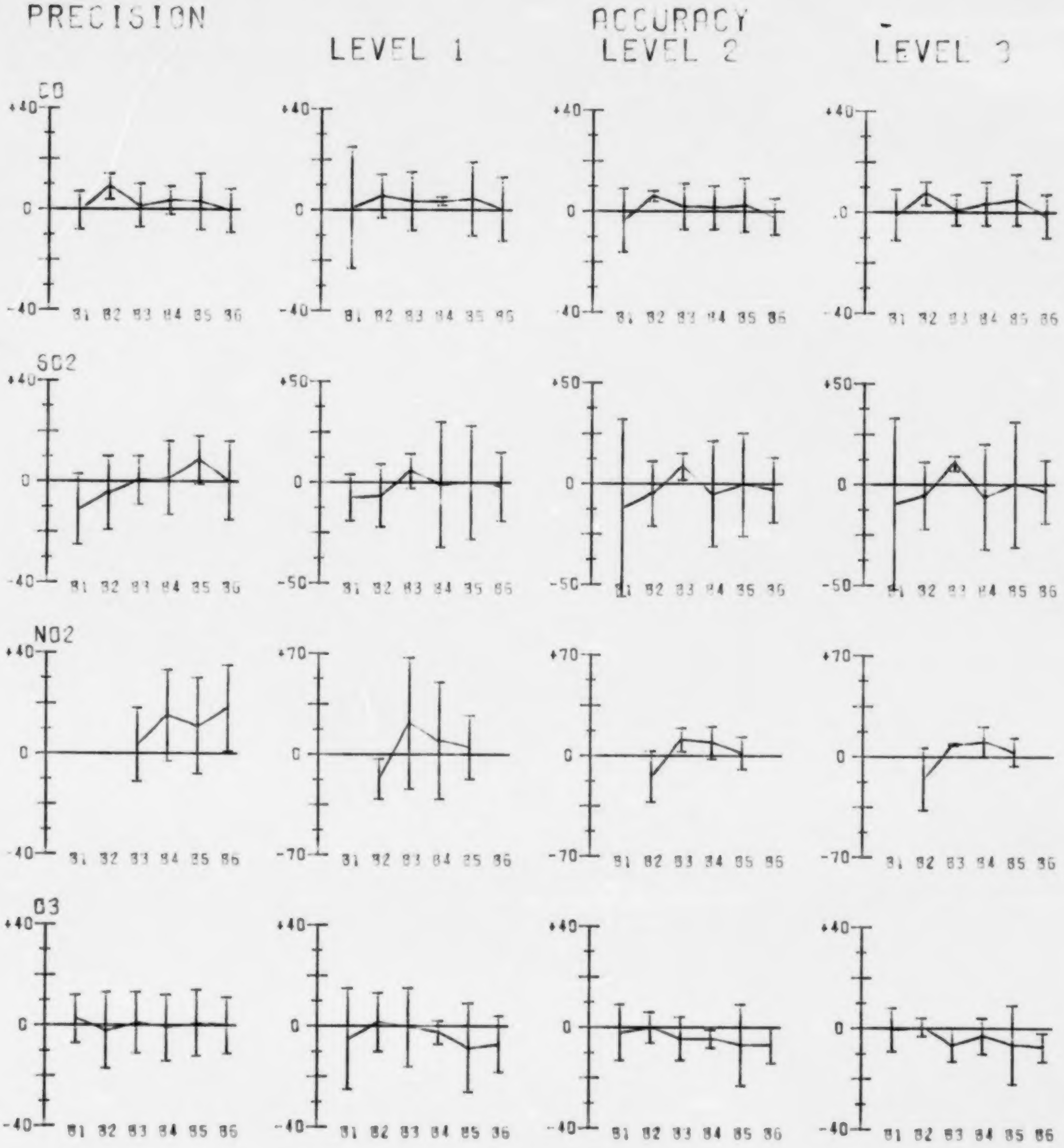






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 36 OHIO
REPORG: 001 OHIO EPA, CENTRAL DIST. OFFICE

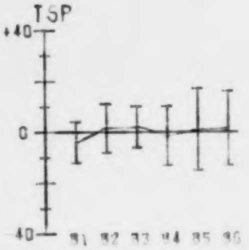


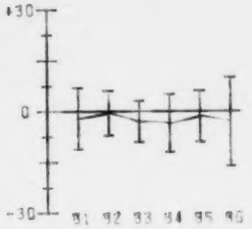
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

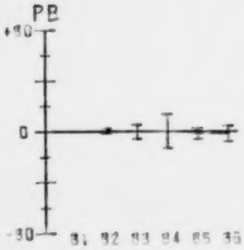
REG : 05
STATE : 36 OHIO
REPORG: 001 OHIO EPA, CENTRAL DIST. OFFICE

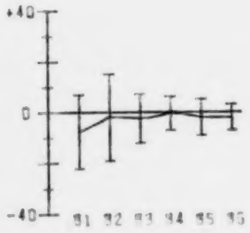
PRECISION

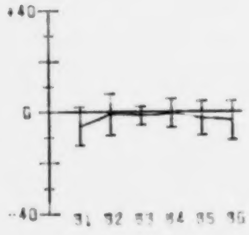
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3









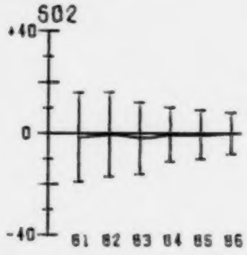


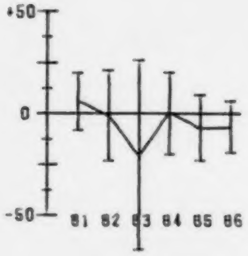
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

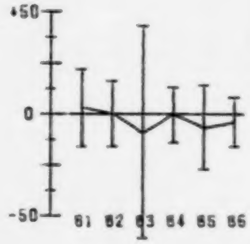
REG   : 05
STATE : 36 OHIO
REPORG : 002 OHIO EPA, NORTHEAST DIST. OFFICE

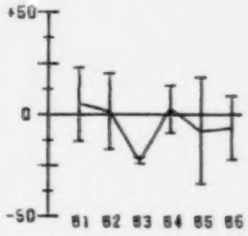
PRECISION

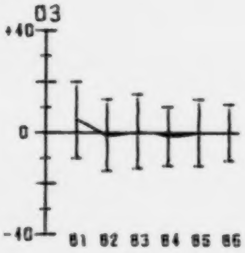
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

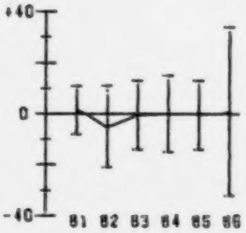


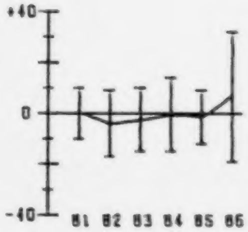


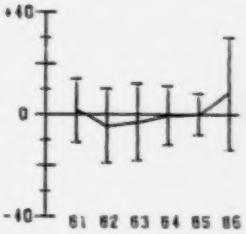












95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 05
STATE : 36 OHIO
REPORG : 002 OHIO EPA, NORTHEAST DIST. OFFICE

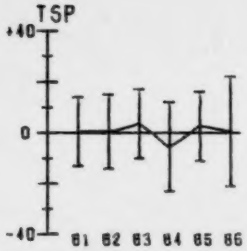
PRECISION

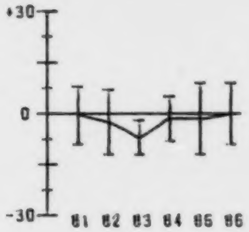
ACCURACY

LEVEL 1

LEVEL 2

LEVEL 3





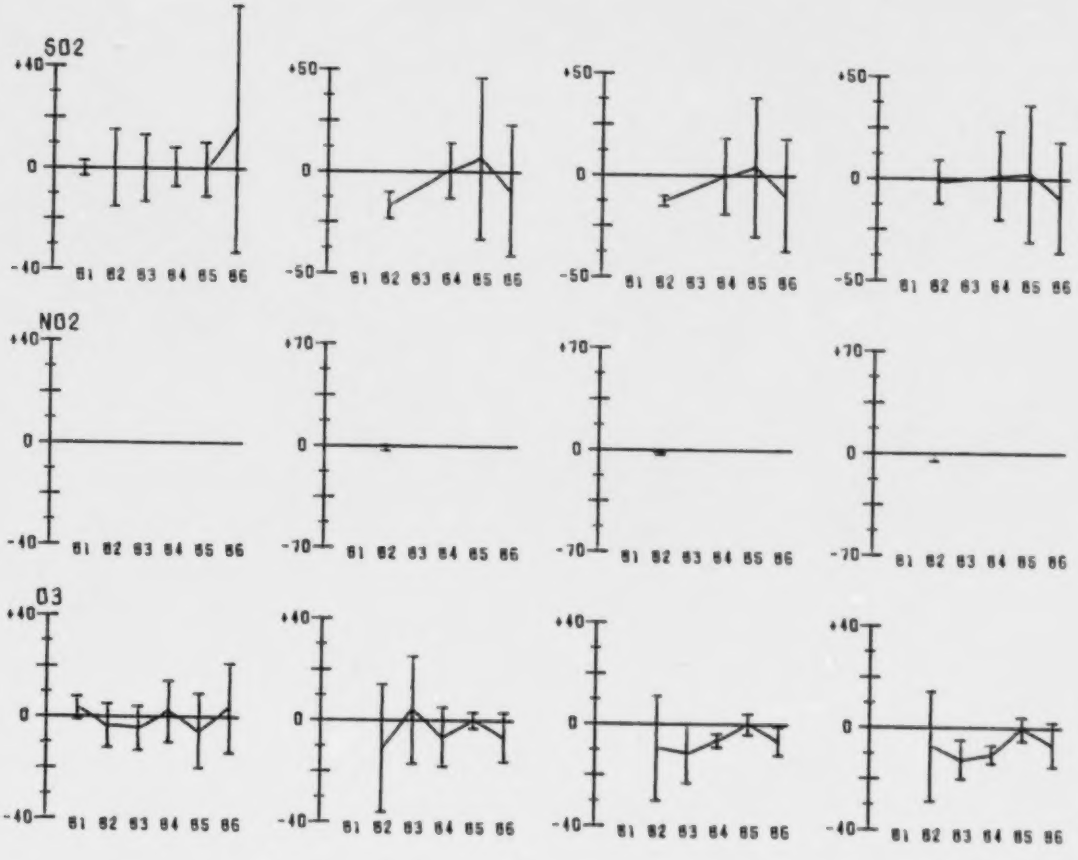
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 36 OHIO
REPORG : 003 OHIO EPA, NORTHWEST DIST. OFFICE

PRECISION

ACCURACY

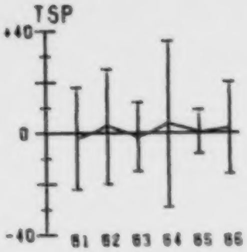
LEVEL 1 LEVEL 2 LEVEL 3

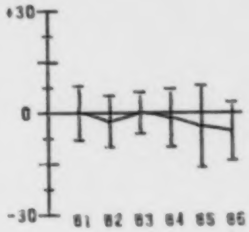


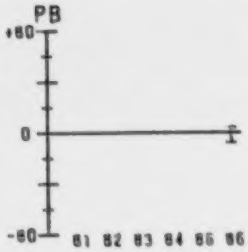
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

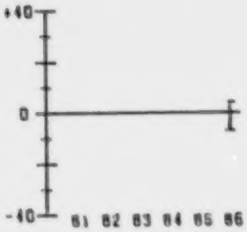
REG   : 05
STATE : 36 OHIO
REPORG : 003 OHIO EPA, NORTHWEST DIST. OFFICE

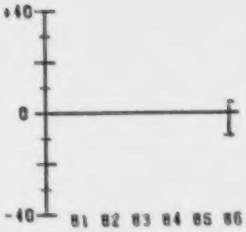
PRECISION   LEVEL 1   ACCURACY LEVEL 2   LEVEL 3











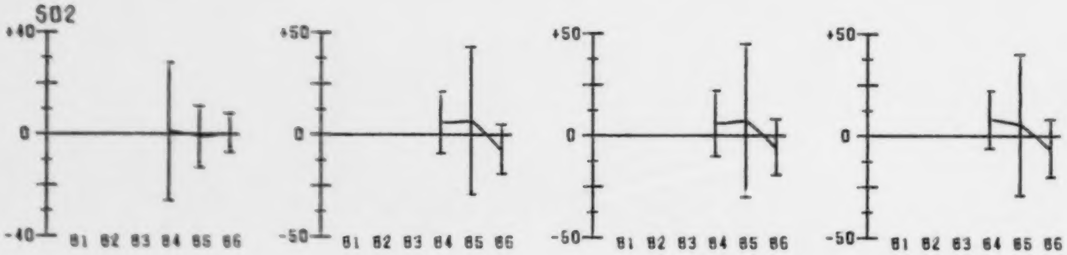
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 36 OHIO
REPORG : 004 OHIO EPA, SOUTHEAST DIST. OFFICE

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



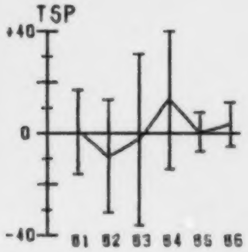
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

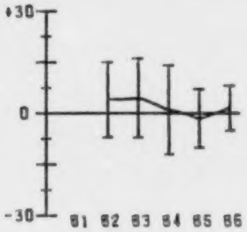
REG   : 05
STATE : 36 OHIO
REPORG : 004 OHIO EPA, SOUTHEAST DIST. OFFICE

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3

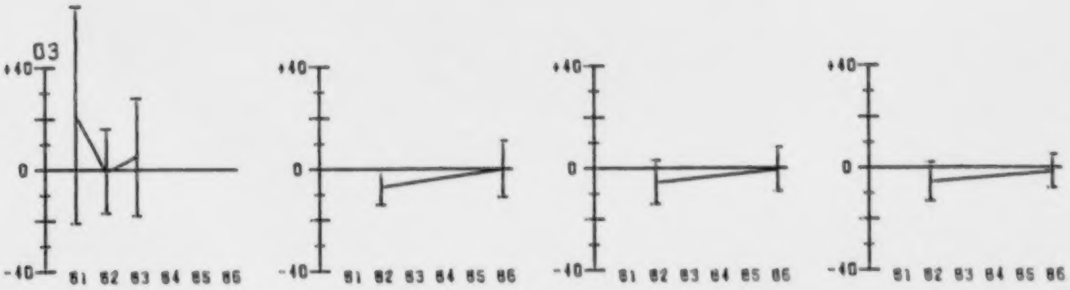




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 36 OHIO
REPORG : 005 OHIO EPA, SOUTHWEST DIST. OFFICE

PRECISION		ACCURACY	
	LEVEL 1	LEVEL 2	LEVEL 3



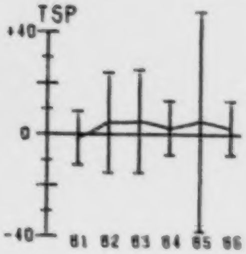
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

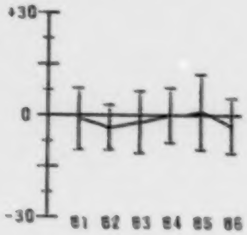
REG : 05
STATE : 36 OHIO
REPORG: 005 OHIO EPA, SOUTHWEST DIST. OFFICE

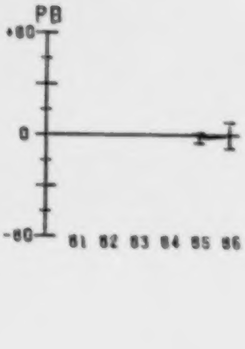
PRECISION

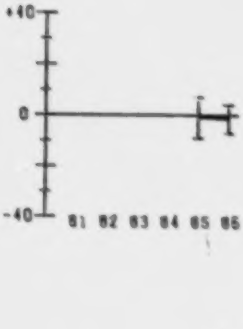
ACCURACY

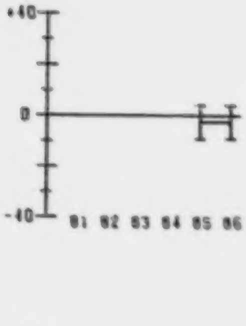
LEVEL 1 LEVEL 2 LEVEL 3





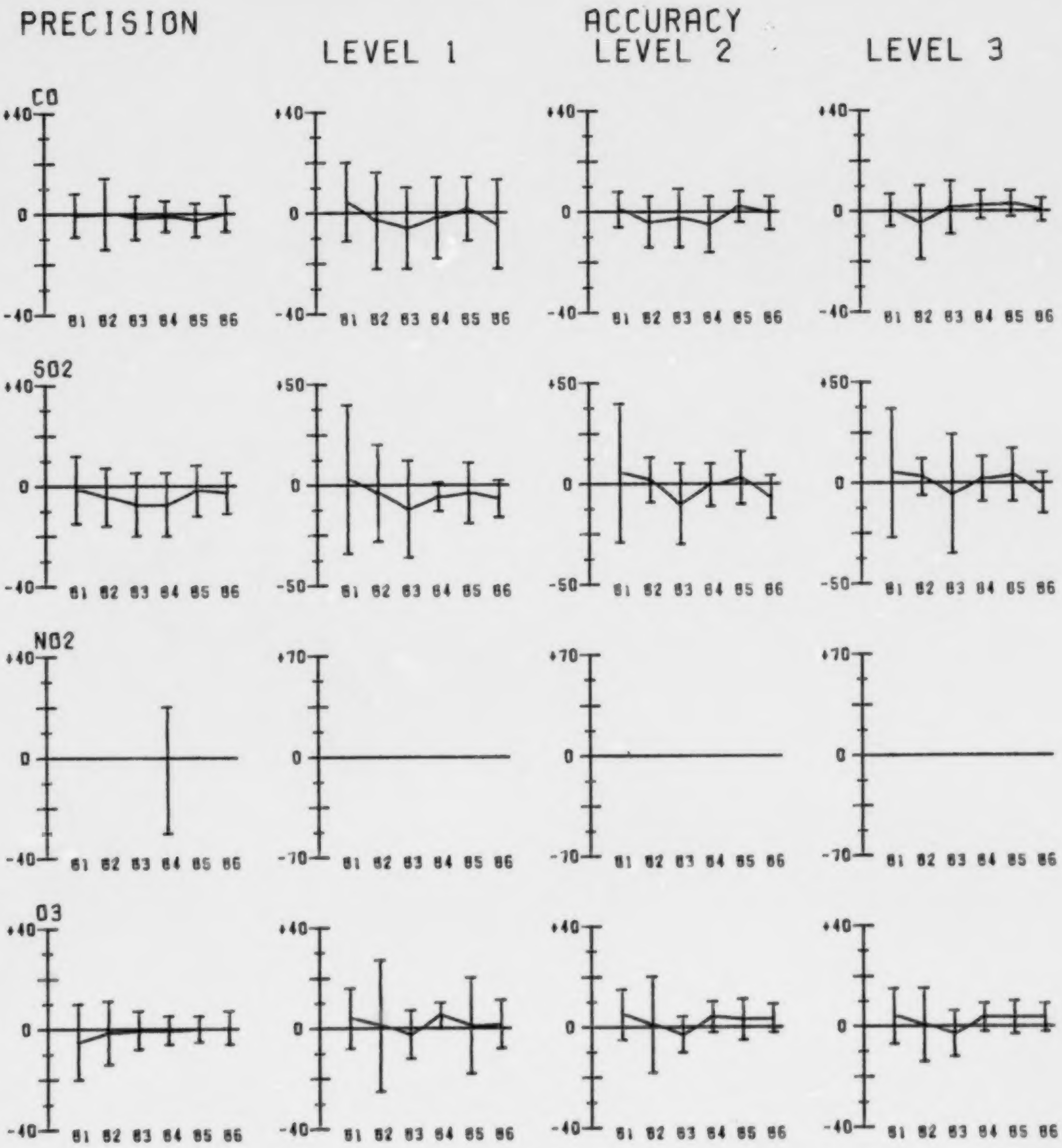






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

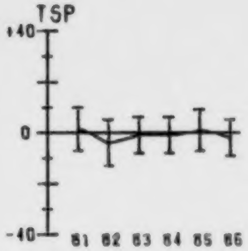
REG   : 05
STATE : 36 OHIO
REPORG: 006 AKRON AIR POLL. CONTROL

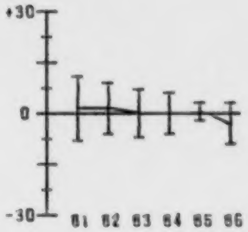


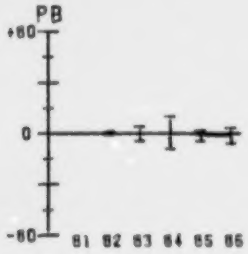
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

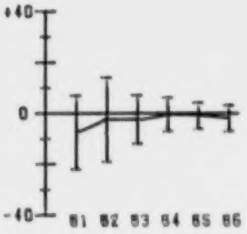
REG   : 05
STATE : 36 OHIO
REPORG: 006 AKRON AIR POLL. CONTROL

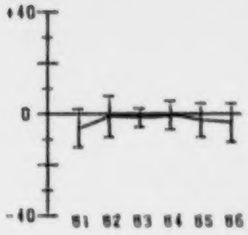
PRECISION		ACCURACY	
	LEVEL 1	LEVEL 2	LEVEL 3





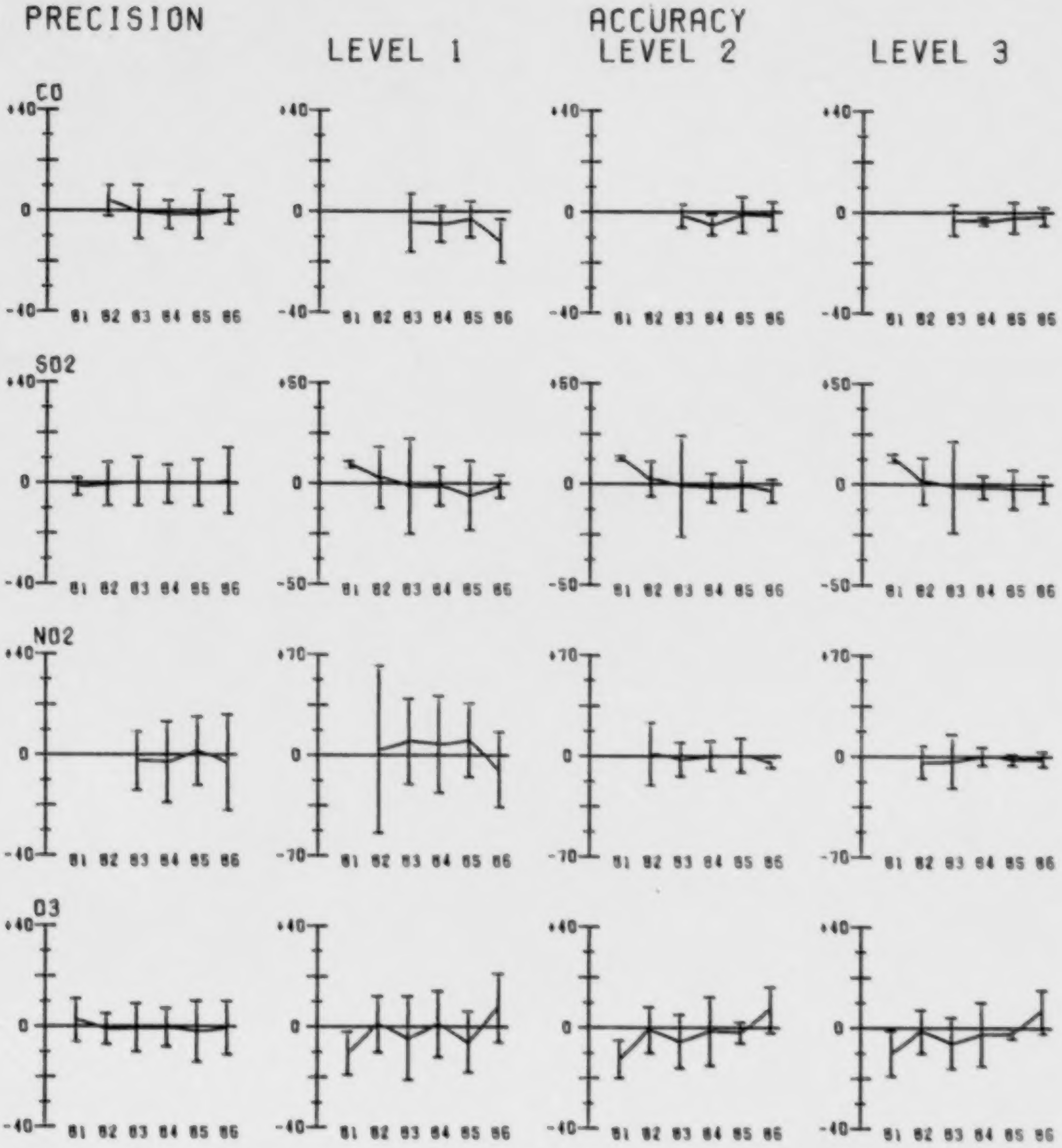






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

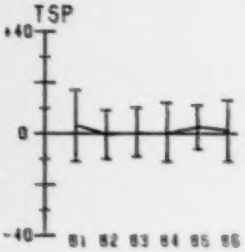
REG   : 05
STATE : 36 OHIO
REPORG: 007 AIR POLL. CONT. DIV., CANTON CITY

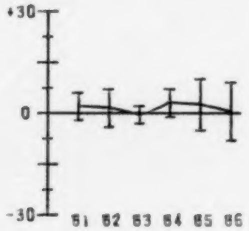


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 05
STATE : 36 OHIO
REPORG: 007 AIR POLL. CONT. DIV., CANTON CITY

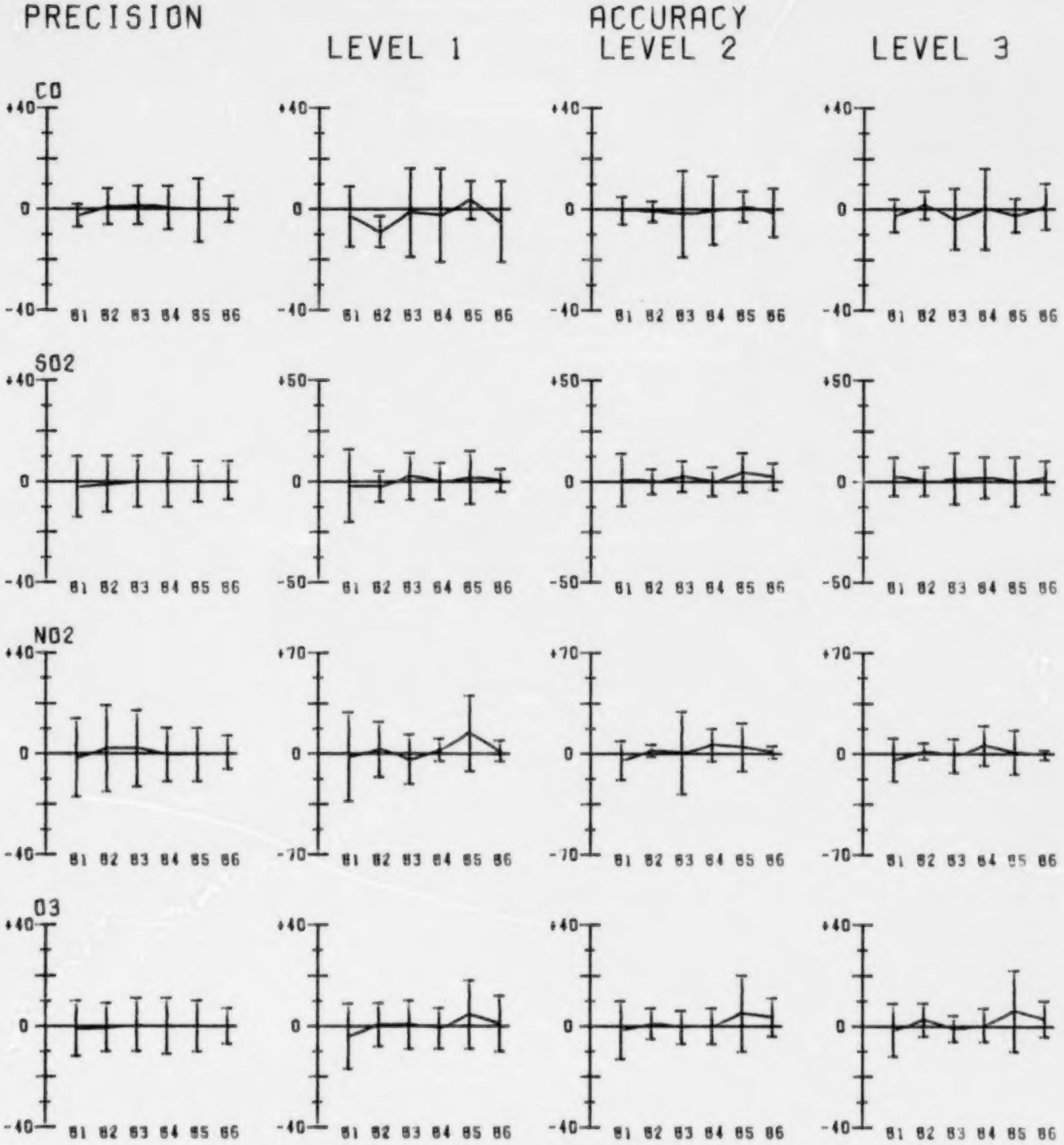
PRECISION | ACCURACY LEVEL 1 | LEVEL 2 | LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 36 OHIO
REPORG: 008 SOUTHWESTERN OHIO AIR POLL. AGENCY



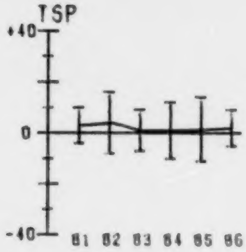
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

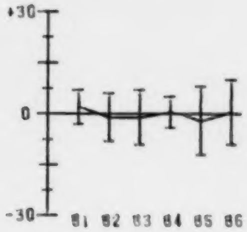
REG   : 05
STATE : 36 OHIO
REPORG : 008 SOUTHWESTERN OHIO AIR POLL. AGENCY

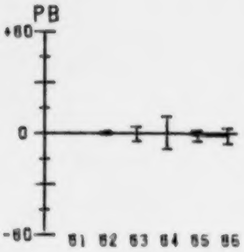
PRECISION

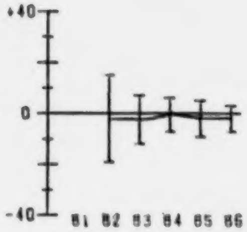
ACCURACY

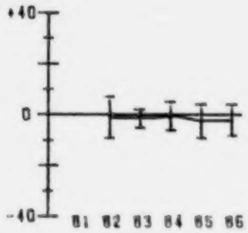
LEVEL 1   LEVEL 2   LEVEL 3





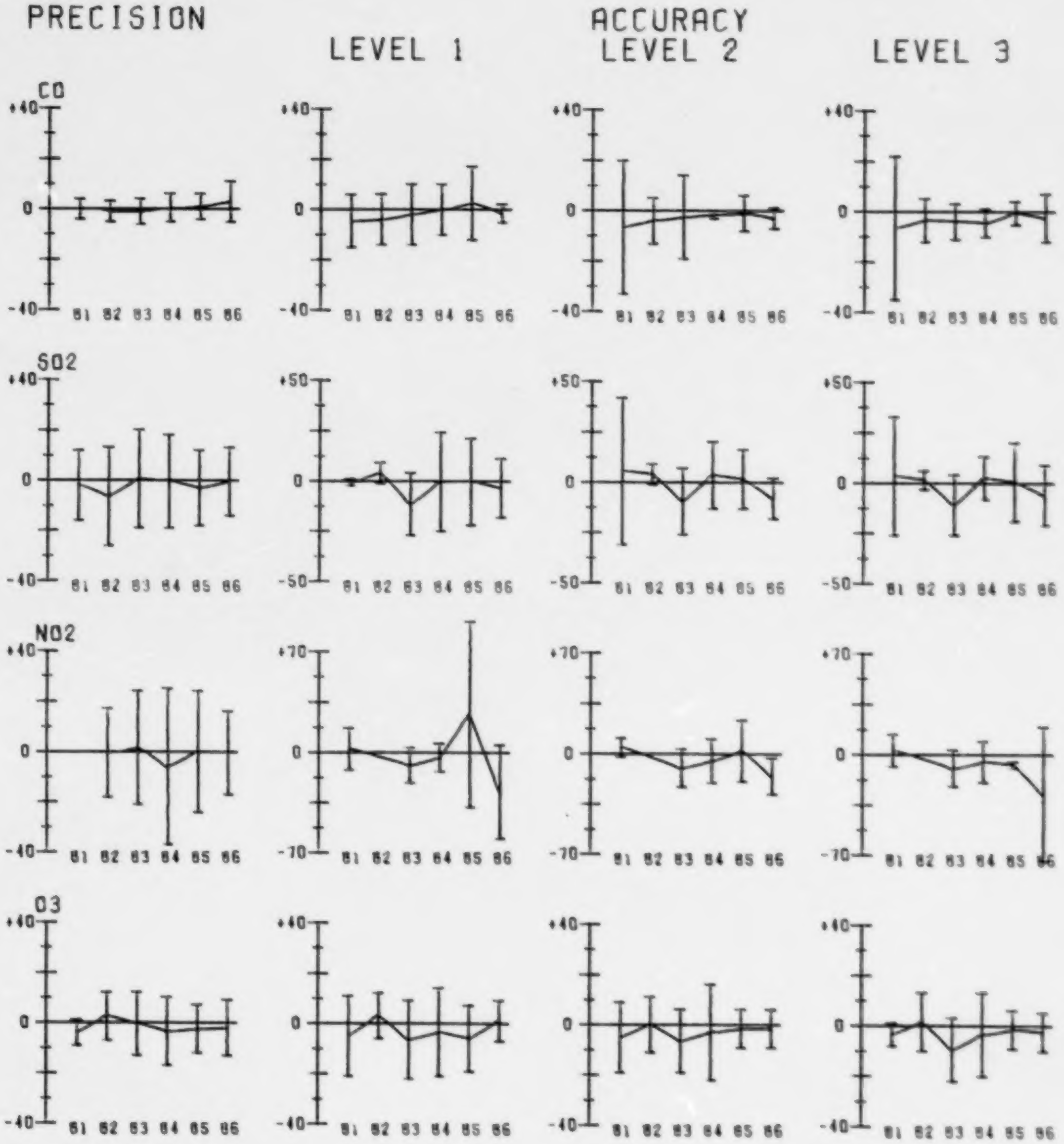






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

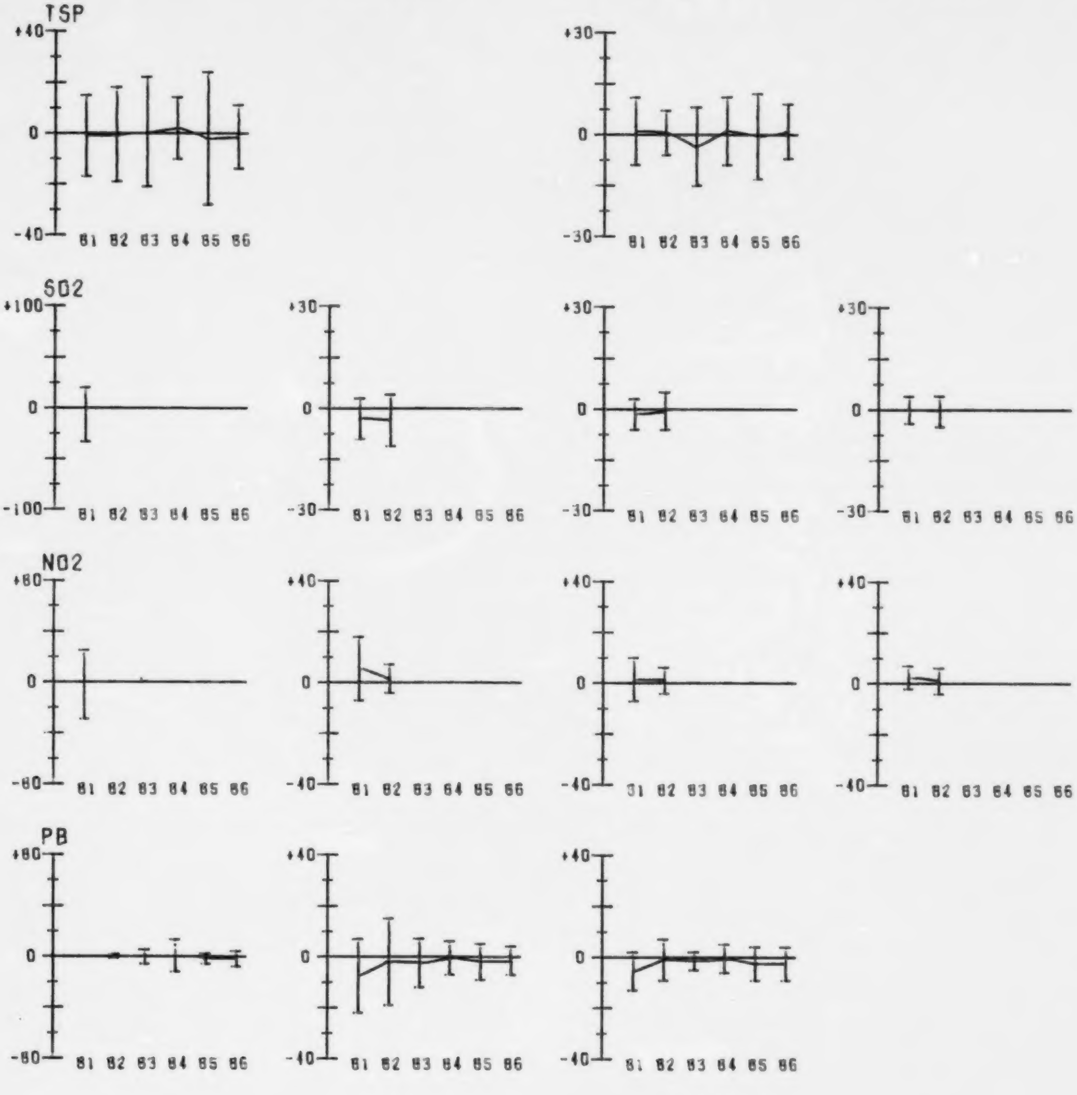
REG   : 05
STATE : 36 OHIO
REPORG: 009 CLEVELAND DIV. OF AIR POLL. AGENCY



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

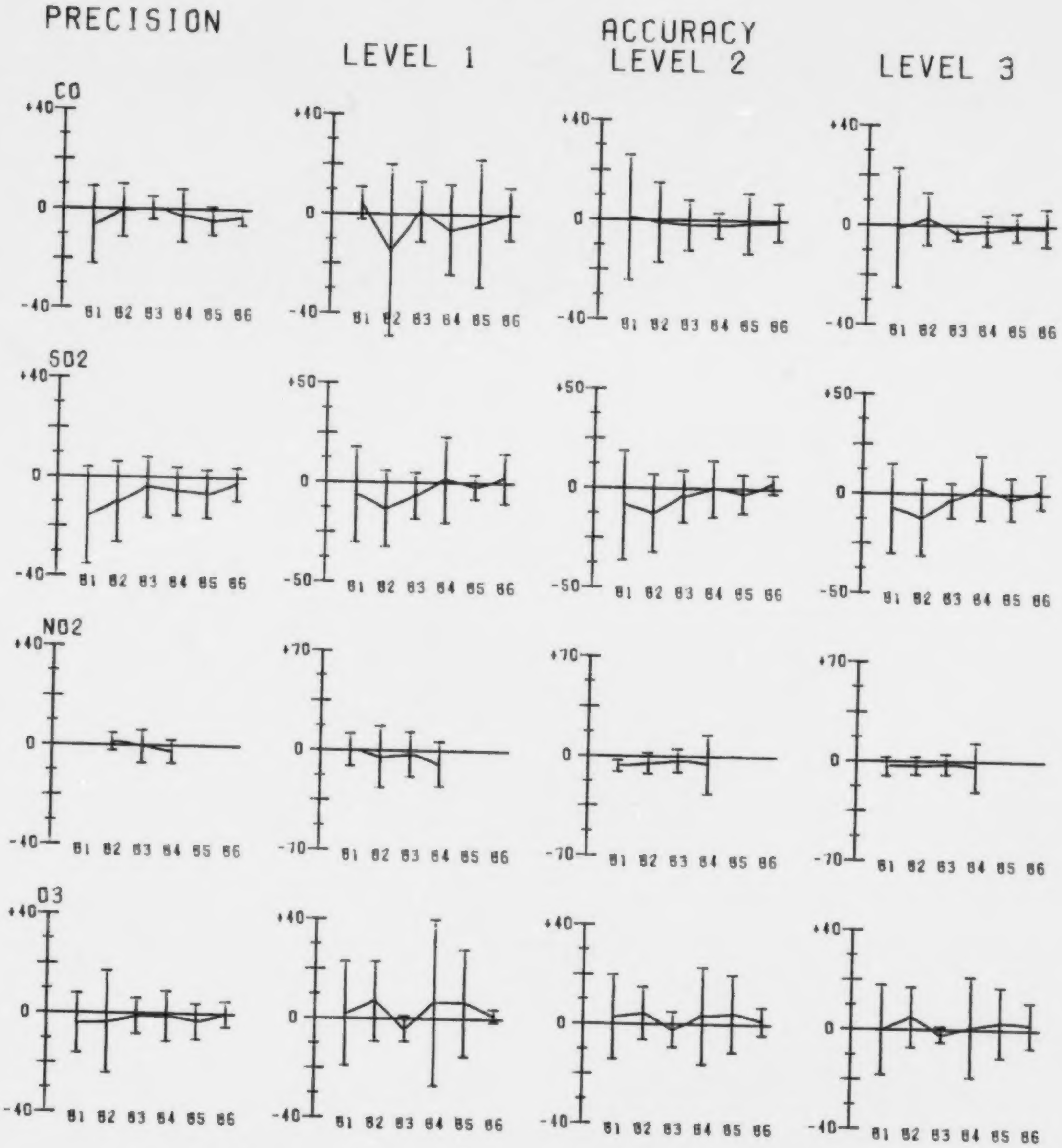
REG   : 05
STATE : 36 OHIO
REPORG: 009 CLEVELAND DIV. OF AIR POLL. AGENCY

PRECISION — ACCURACY LEVEL 1 — LEVEL 2 — LEVEL 3



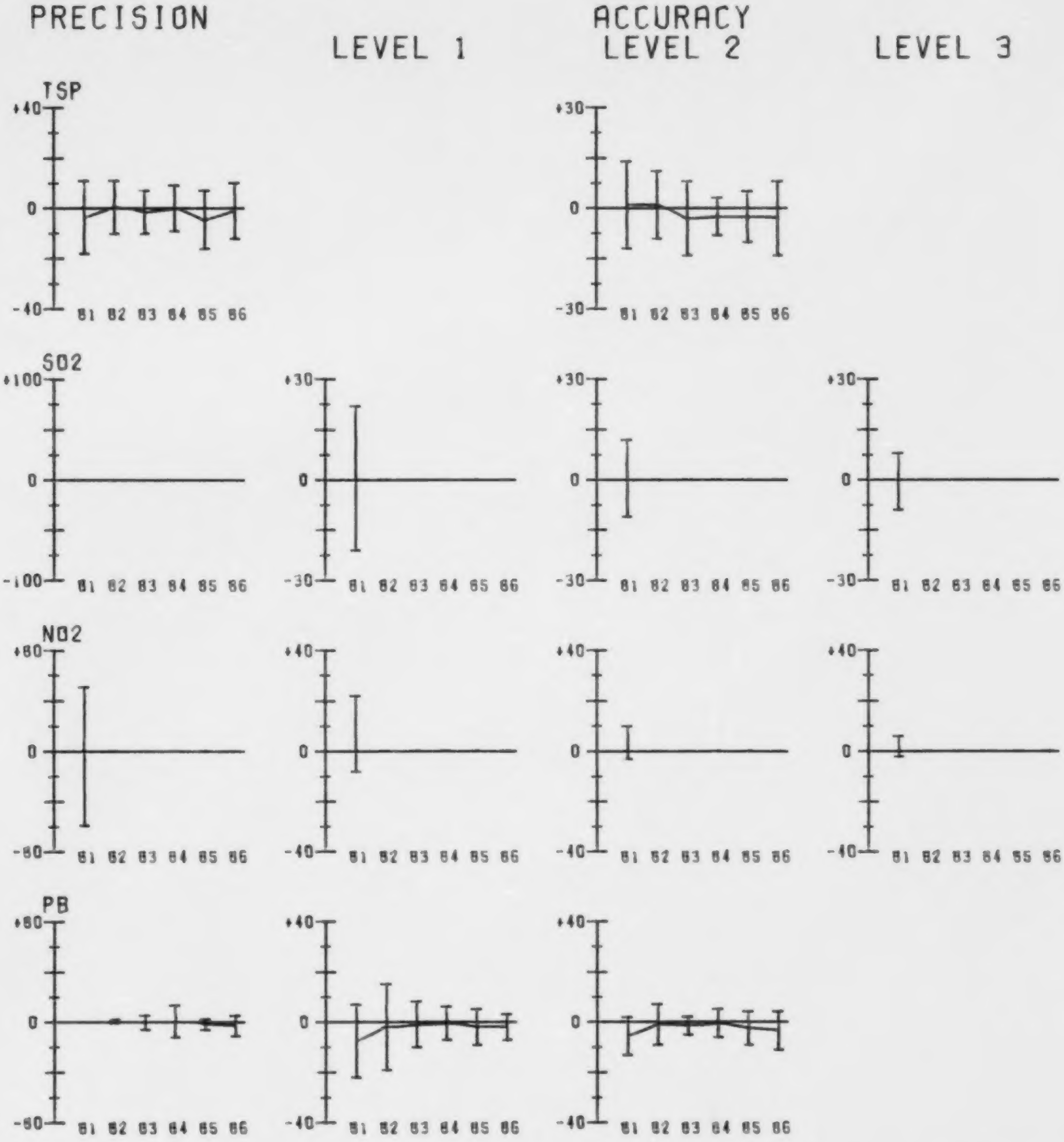
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 36 OHIO
REPORG : 010 REGIONAL APC AGENCY DAYTON



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 05
STATE : 36 OHIO
REPORG: 010 REGIONAL APC AGENCY DAYTON

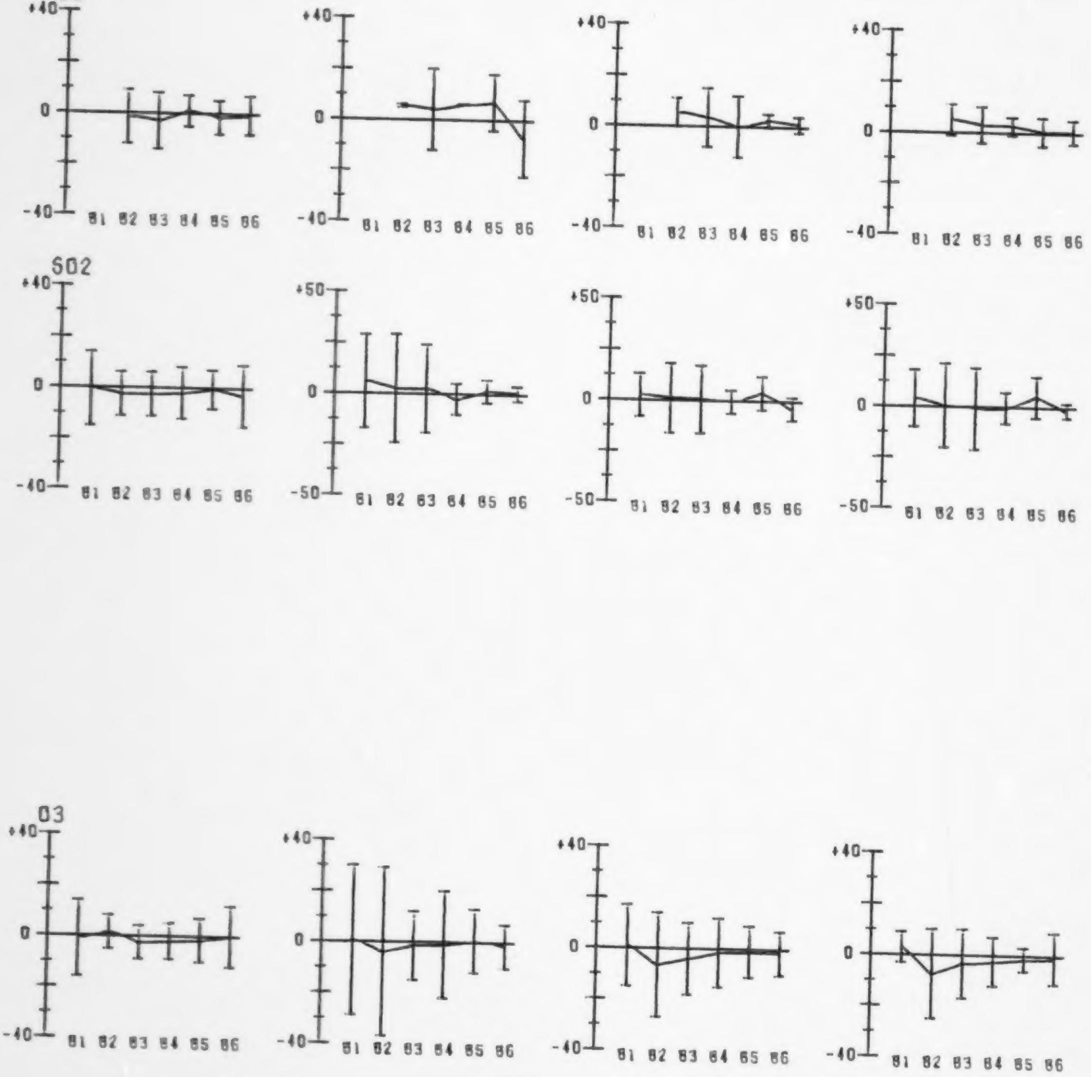


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 36 OHIO
REPORG: 012 AIR POLL. CONT. DIV. OF LAKE CNTY.

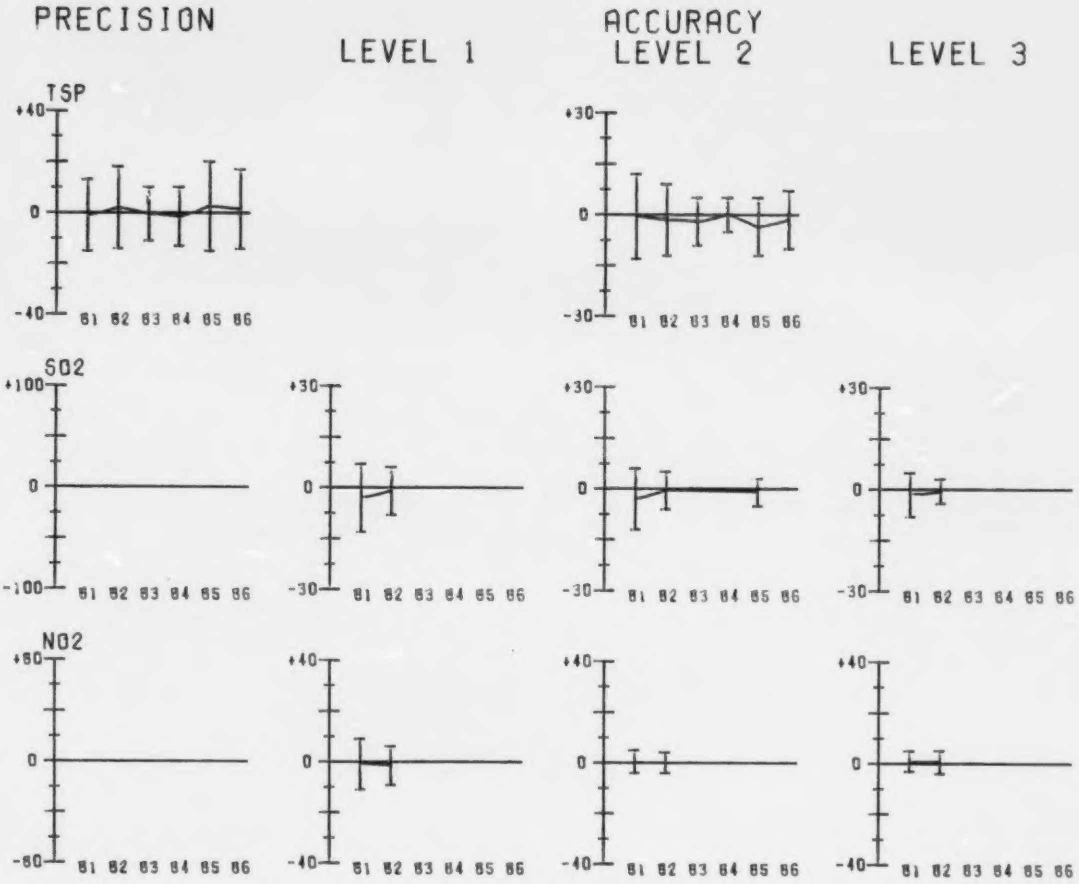
PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 05
STATE : 36 OHIO
REPORG : 012 AIR POLL. CONT. DIV. OF LAKE CNTY.



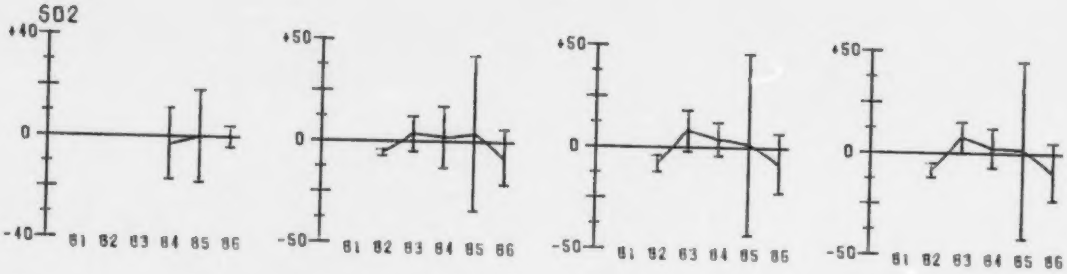
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 36 OHIO
REPORG: 013 AIR POLL. UNIT, PORTSMOUTH CITY

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3



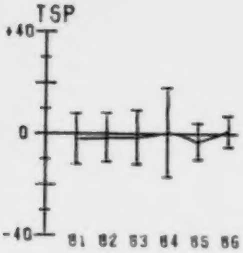
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

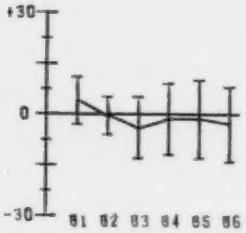
REG : 05
STATE : 36 OHIO
REPORG: 013 AIR POLL. UNIT, PORTSMOUTH CITY

PRECISION

ACCURACY

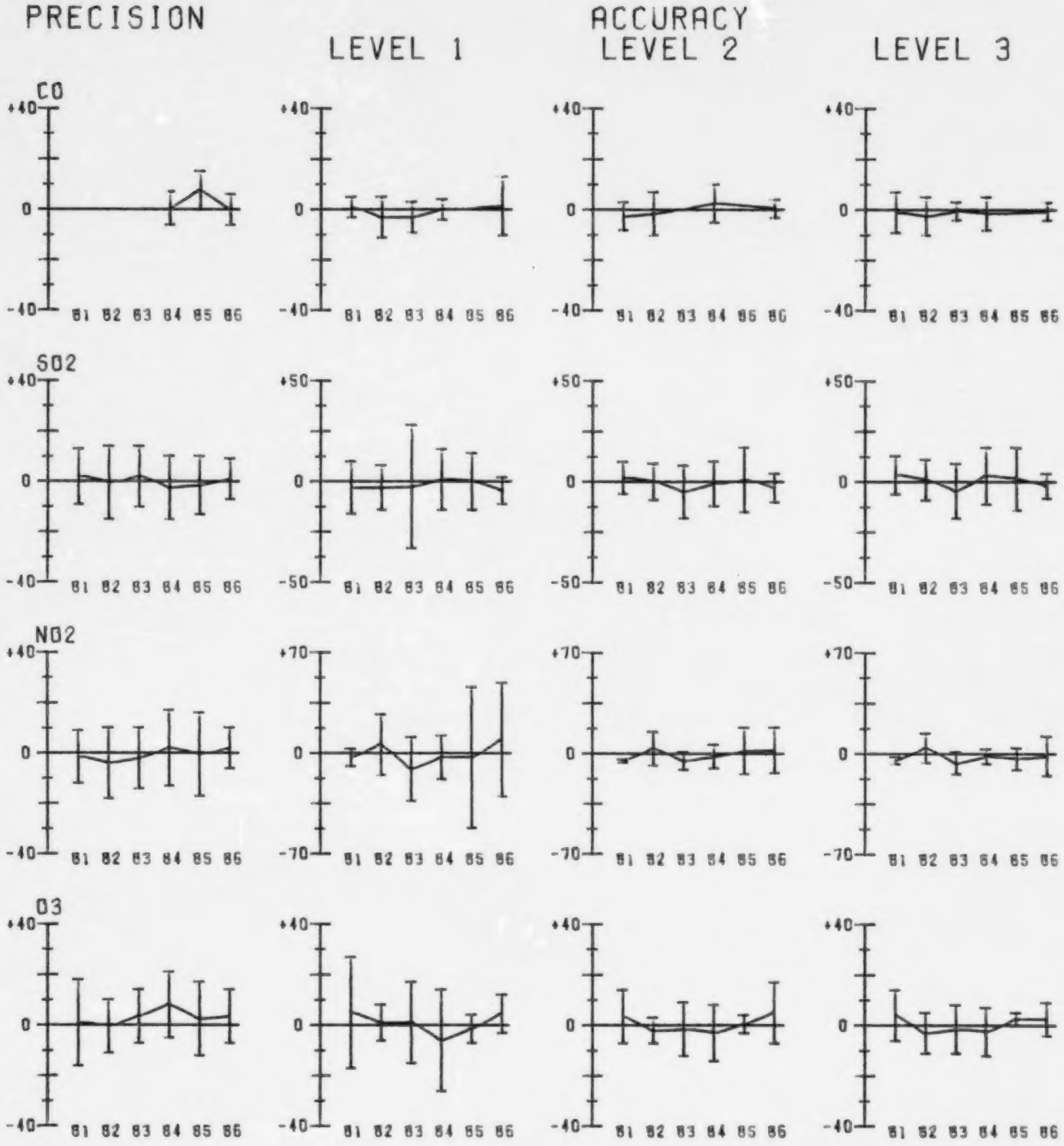
LEVEL 1 LEVEL 2 LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 36 OHIO
REPORG: 014 NORTH OHIO VALLEY AIR AUTHORITY

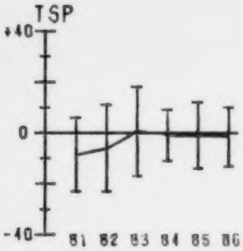


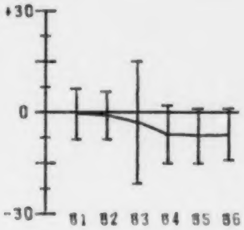
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 05
STATE : 36 OHIO
REPORG: 014 NORTH OHIO VALLEY AIR AUTHORITY

PRECISION

ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3

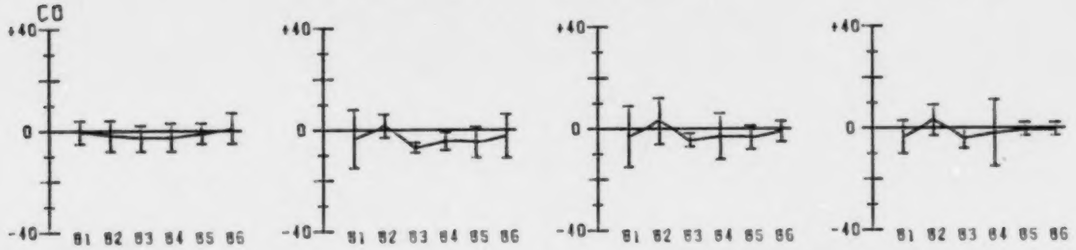


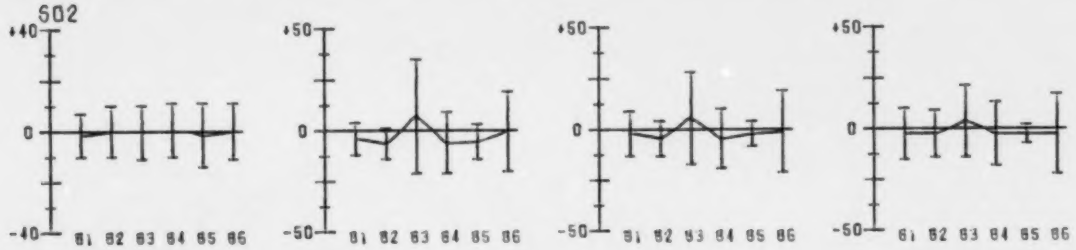


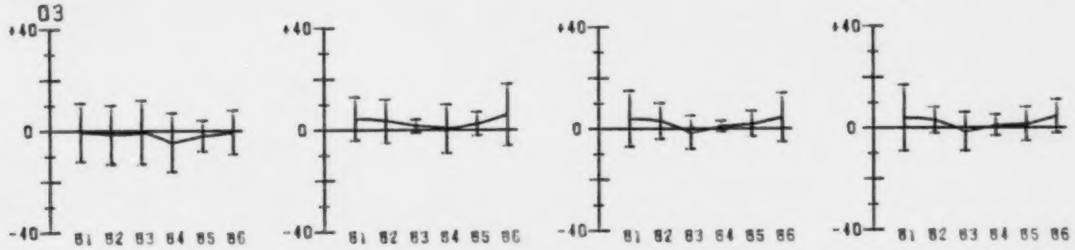
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 36   OHIO
REPORG : 015 TOLEDO POLL. CONTROL AGENCY

PRECISION | ACCURACY LEVEL 1 | ACCURACY LEVEL 2 | ACCURACY LEVEL 3







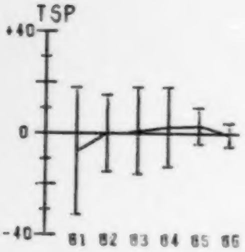
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

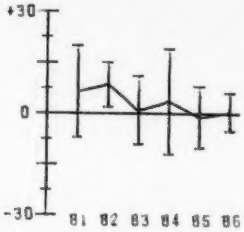
REG : 05
STATE : 36 OHIO
REPORG: 015 TOLEDO POLL. CONTROL AGENCY

PRECISION

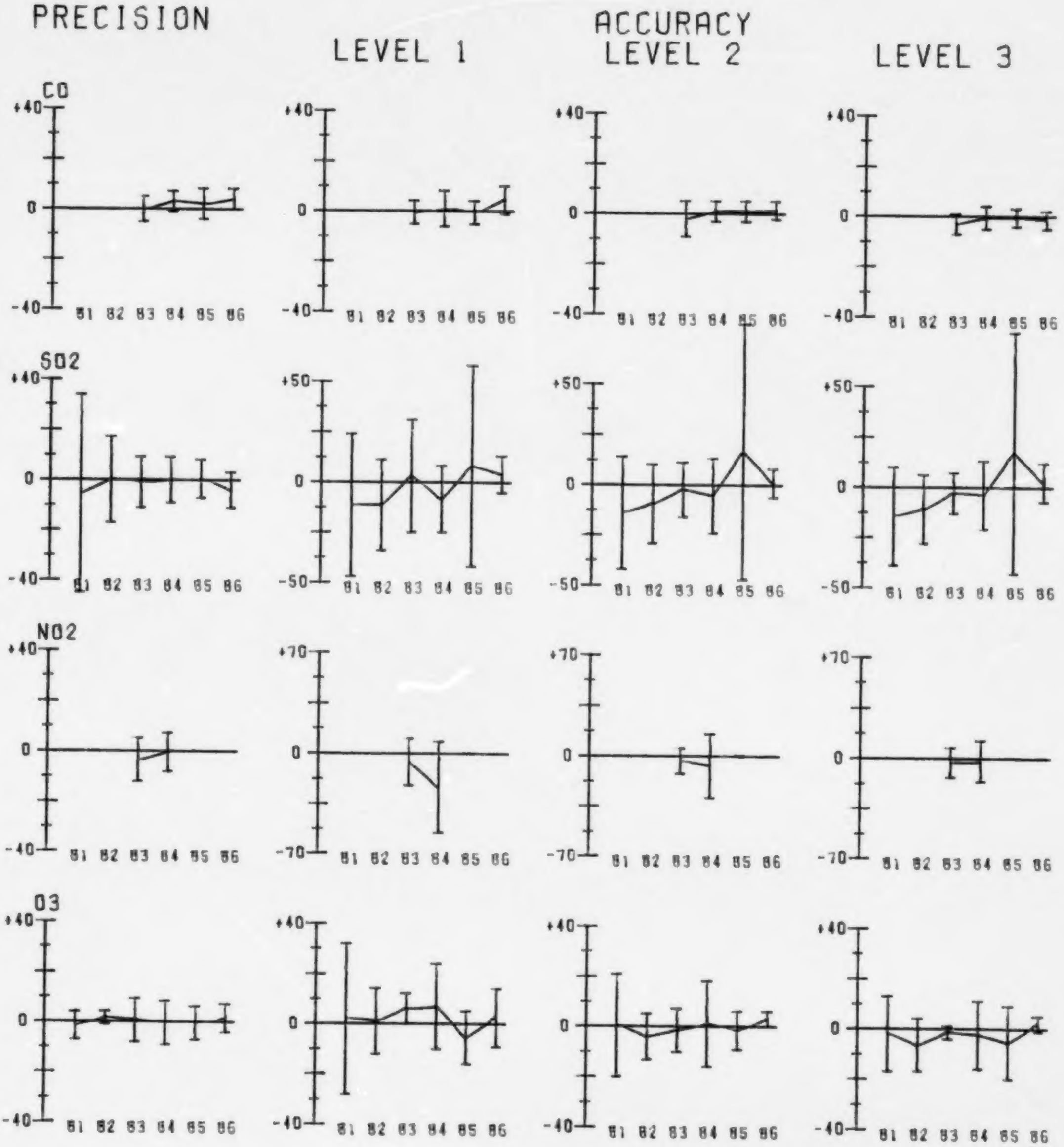
ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3





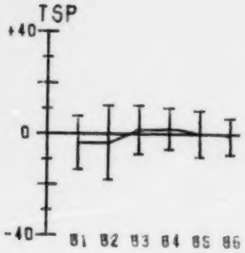
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS
REG : 05
STATE : 36 OHIO
REPORG: 016 MAHONING TRUMBULL AIR POLL. CONTROL

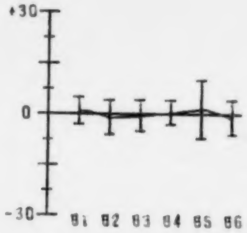


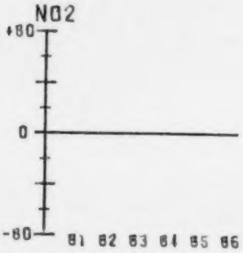
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

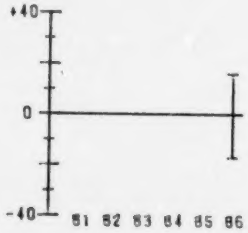
REG   : 05
STATE : 36 OHIO
REPORG: 016 MAHONING TRUMBULL AIR POLL. CONTROL

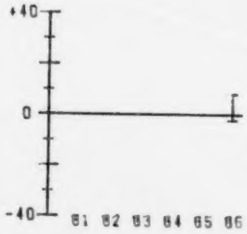
PRECISION   LEVEL 1   ACCURACY LEVEL 2   LEVEL 3

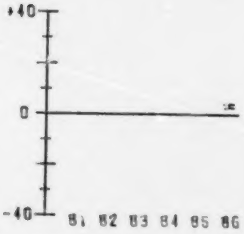


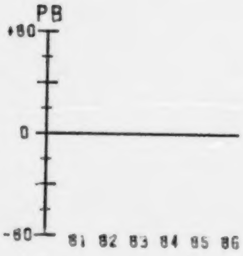


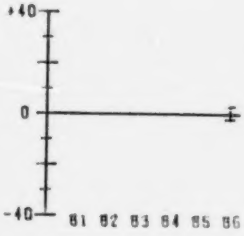


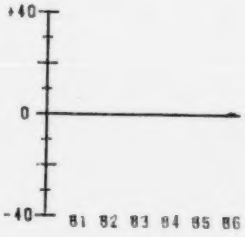






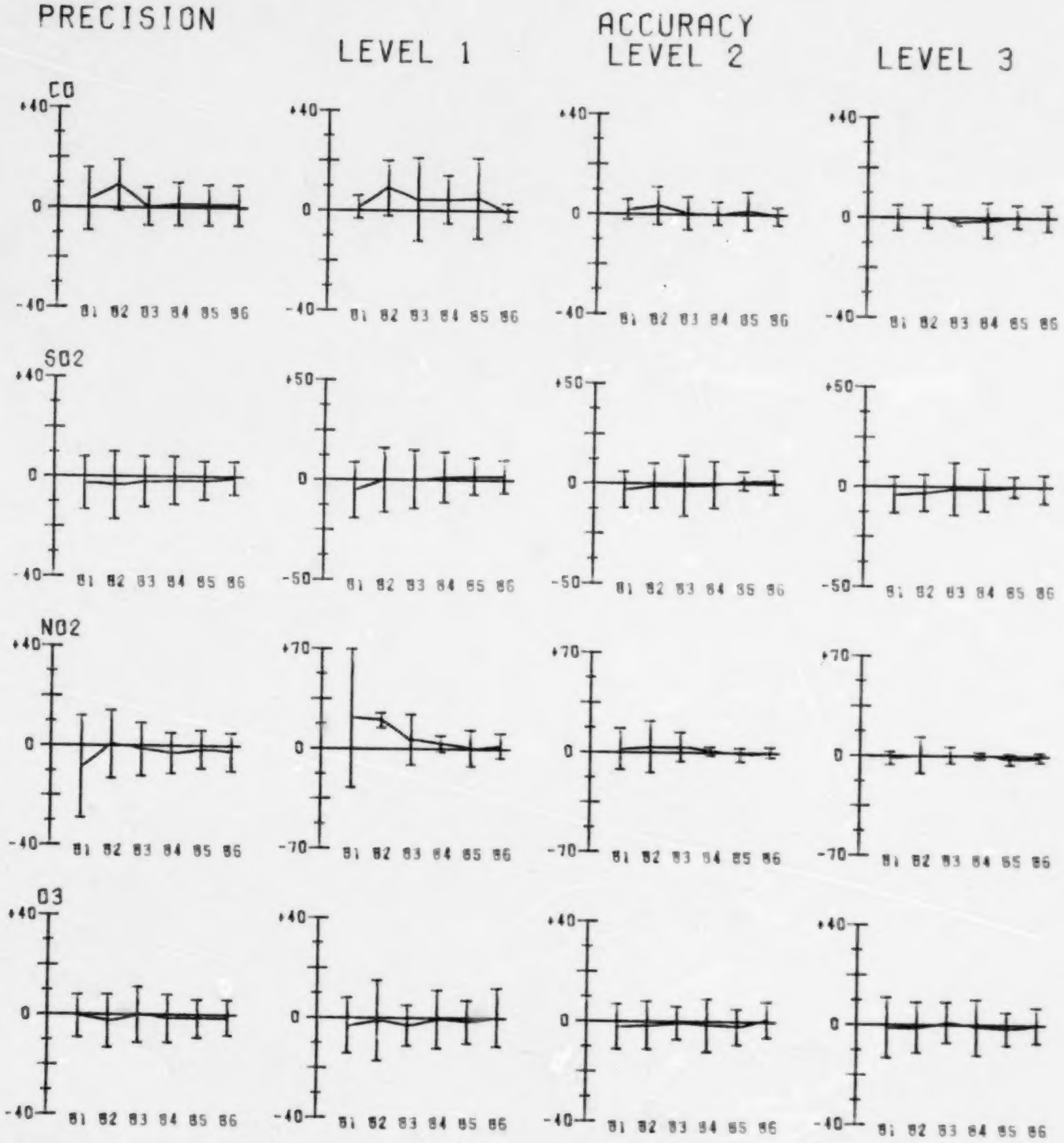






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 05
STATE : 51   WISCONSIN
REPORG : 001 WI. DEPT. OF NAT. RES., AIR MONIT. UNIT



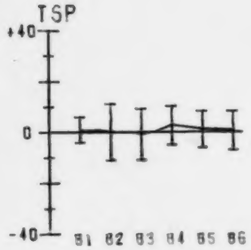
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

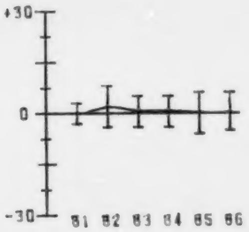
REG : 05
STATE : 51 WISCONSIN
REPORG: 001 WI. DEPT. OF NAT. RES., AIR MONIT. UNIT

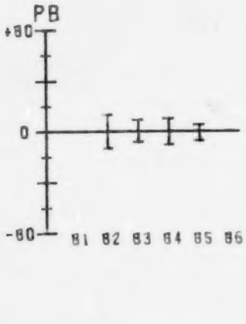
PRECISION

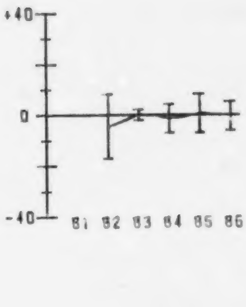
ACCURACY

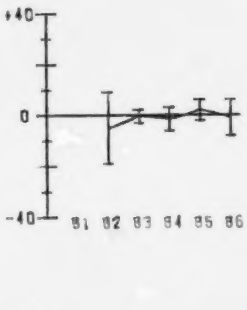
LEVEL 1 LEVEL 2 LEVEL 3





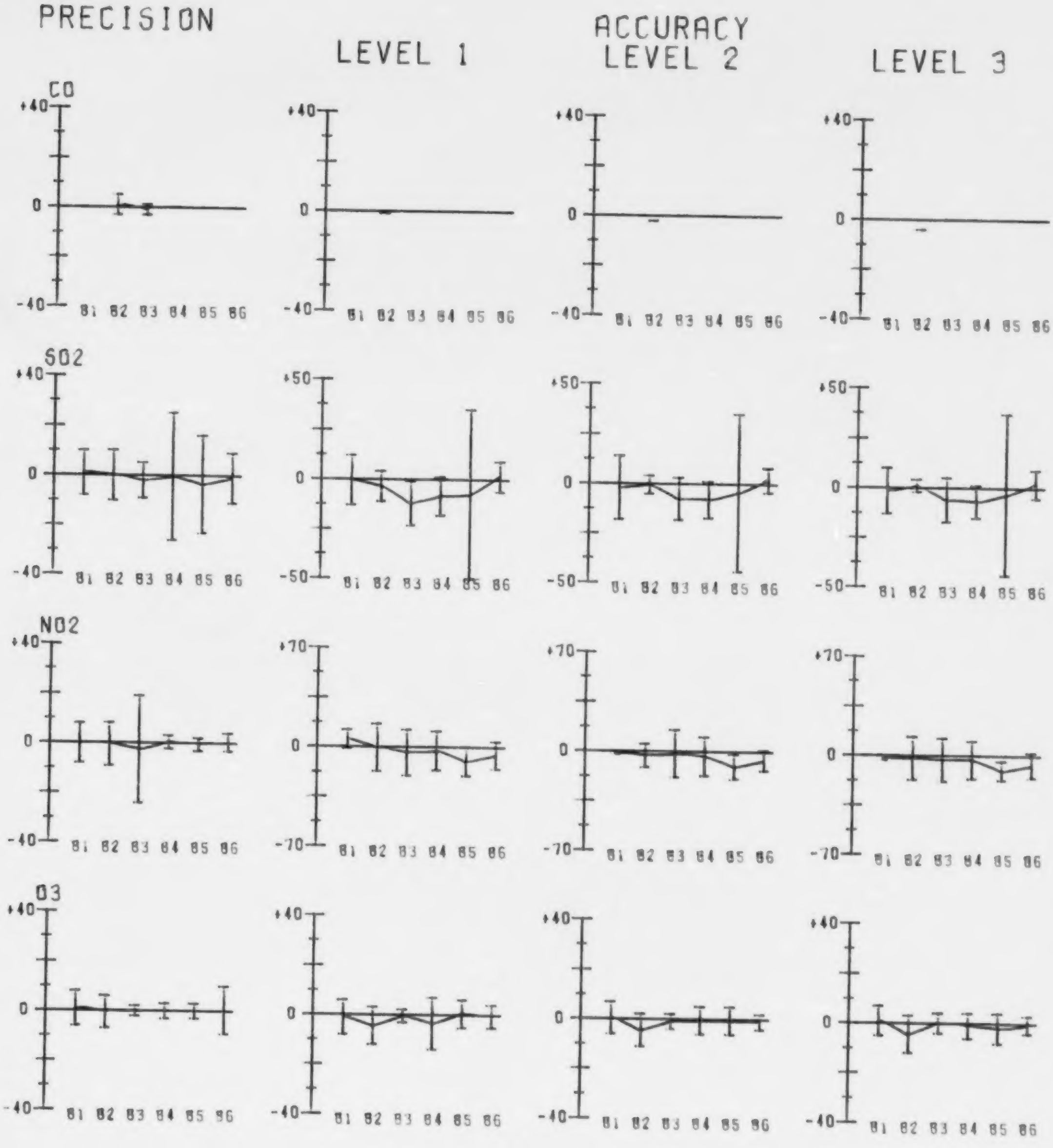






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 06
STATE : 04 ARKANSAS
REPORG: 001 DEPT. OF POLL. CONT. & ECOLOGY CONT. MON

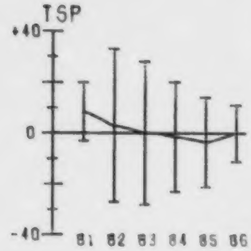


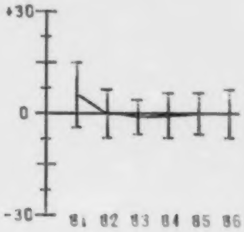
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

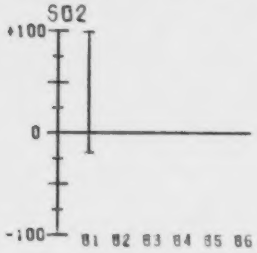
REG : 06
STATE : 04 ARKANSAS
REPORG: 002 DEPT. OF POLL. CONT. & ECOLOGY

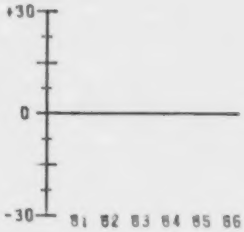
PRECISION

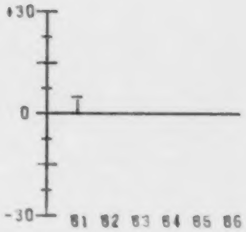
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

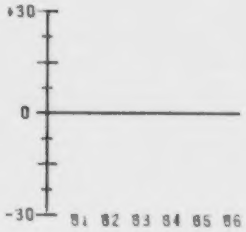


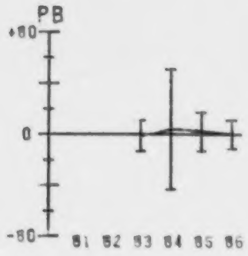


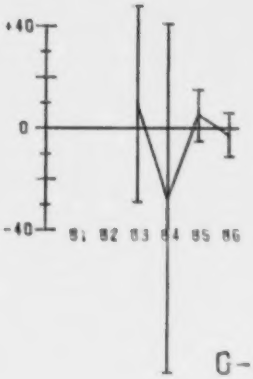


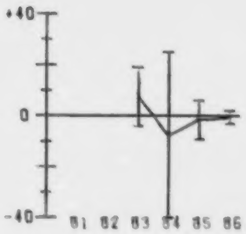






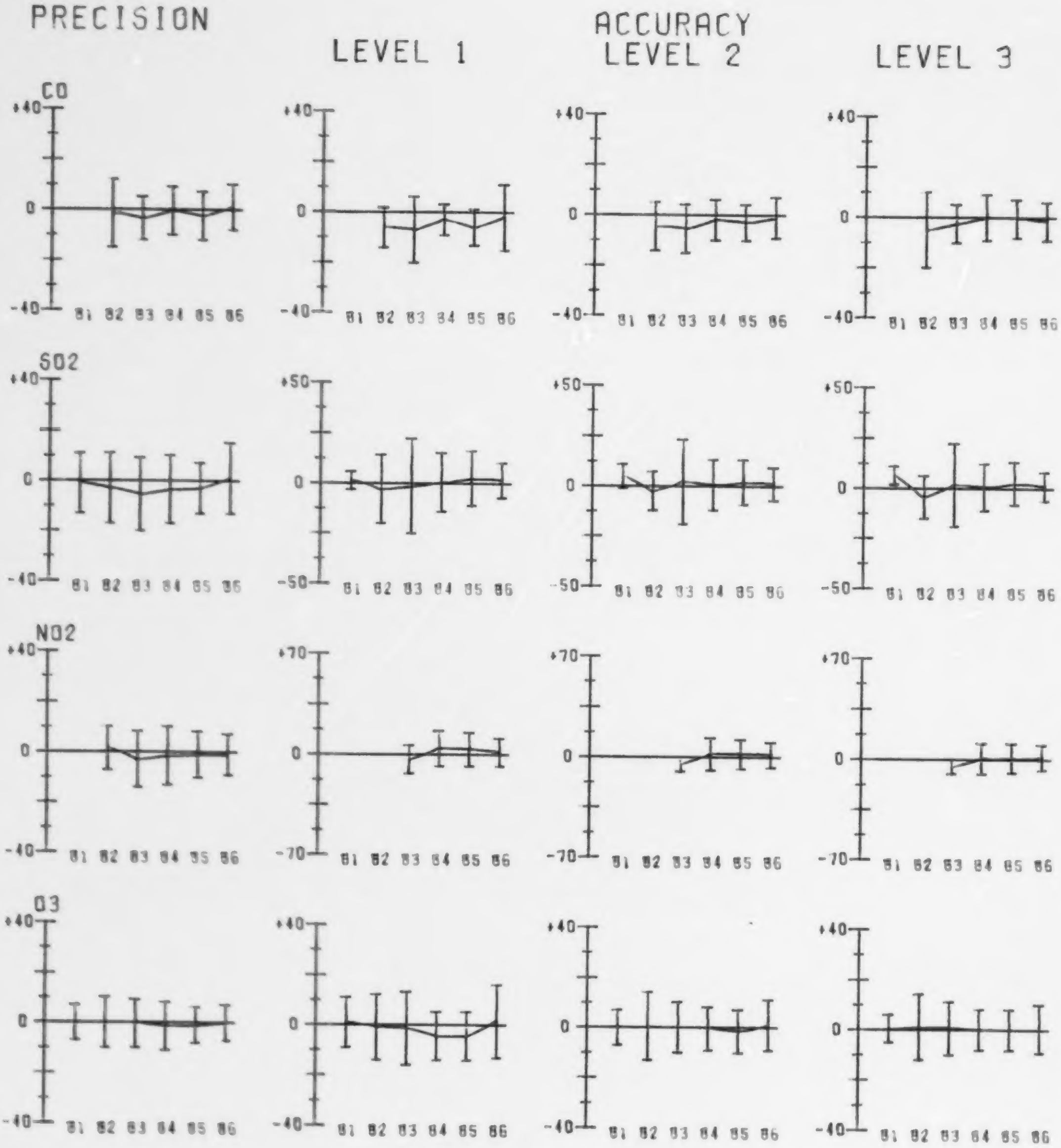






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 06
STATE : 19 LOUISIANA
REPORG : 001 LOUISIANA DEPT. OF ENVIRONMENTAL QUALITY

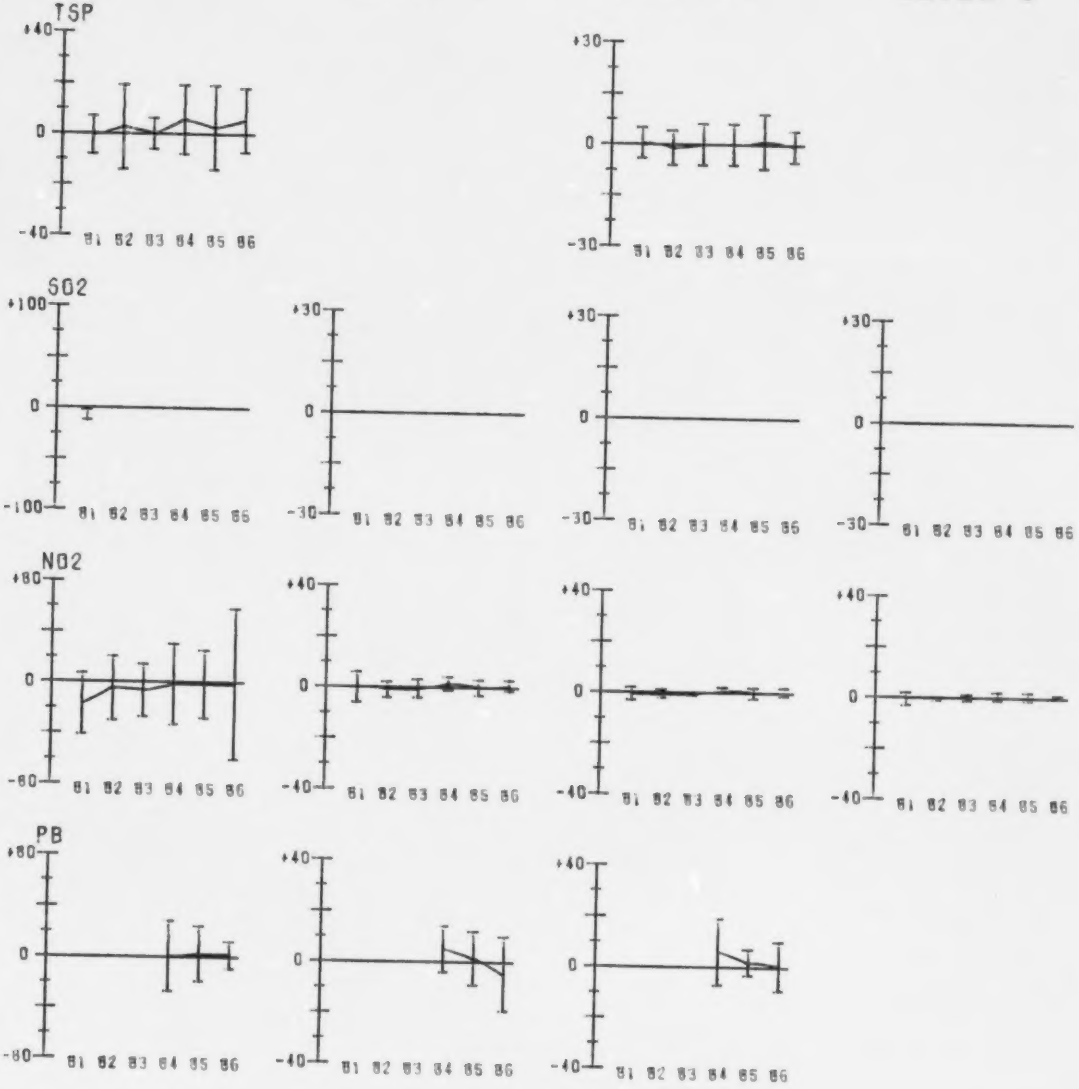


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 06
STATE : 19 LOUISIANA
REPORG: 001 LOUISIANA DEPT. OF ENVIRONMENTAL QUALITY

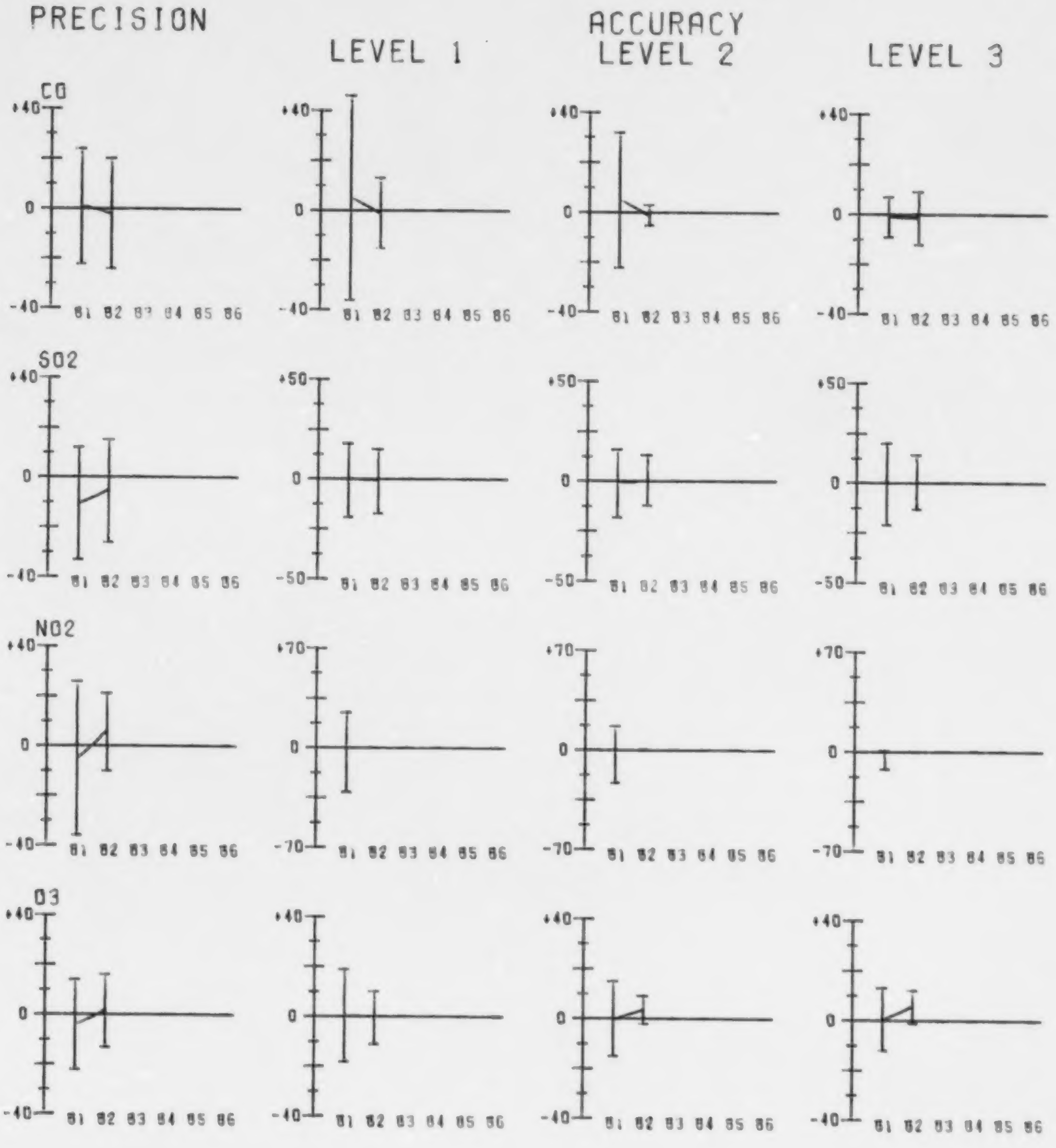
PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



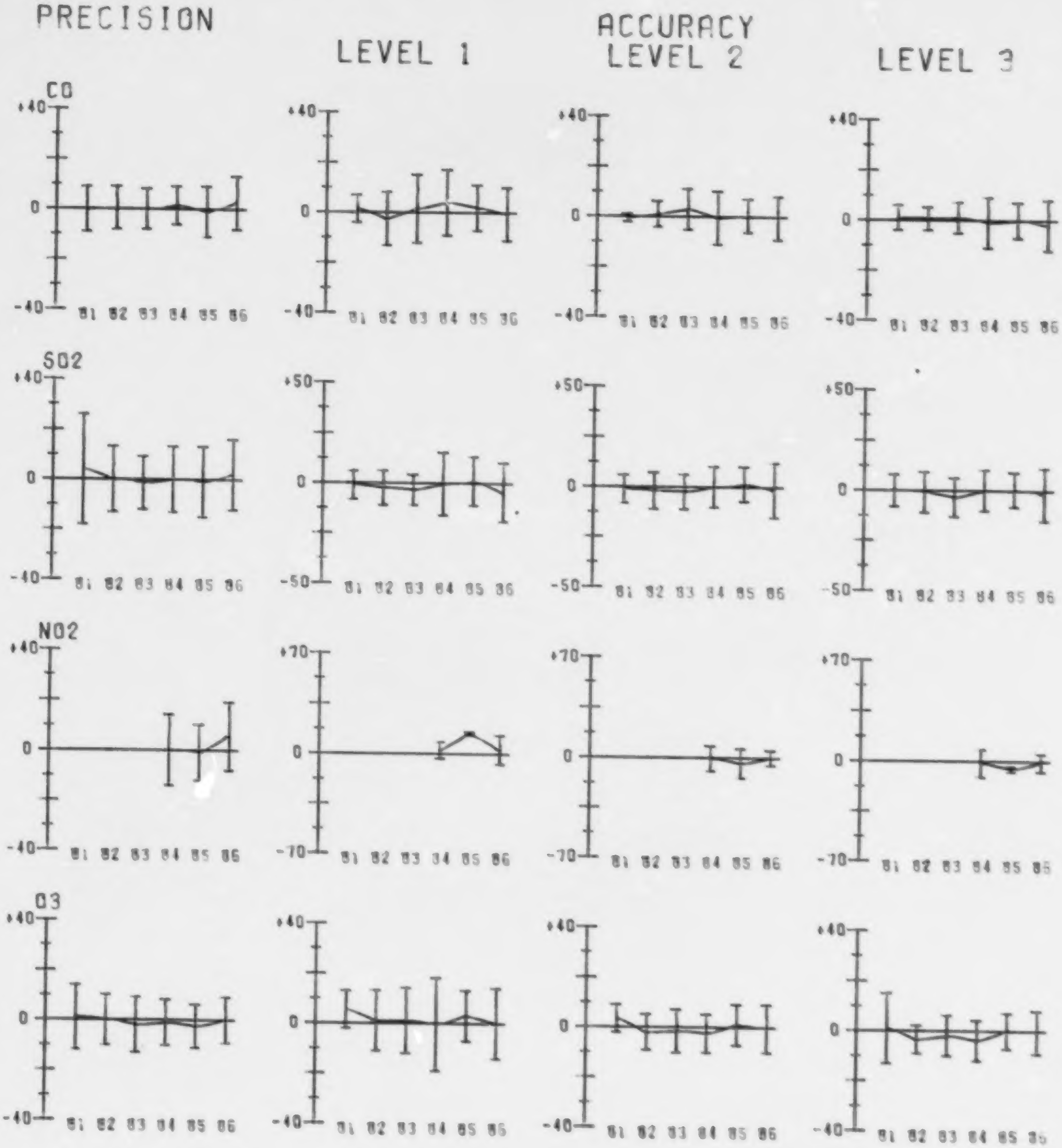
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 06
STATE : 19 LOUISIANA
REPORG: 002 KEMRON ENV. SERVICES, BATON ROUGE



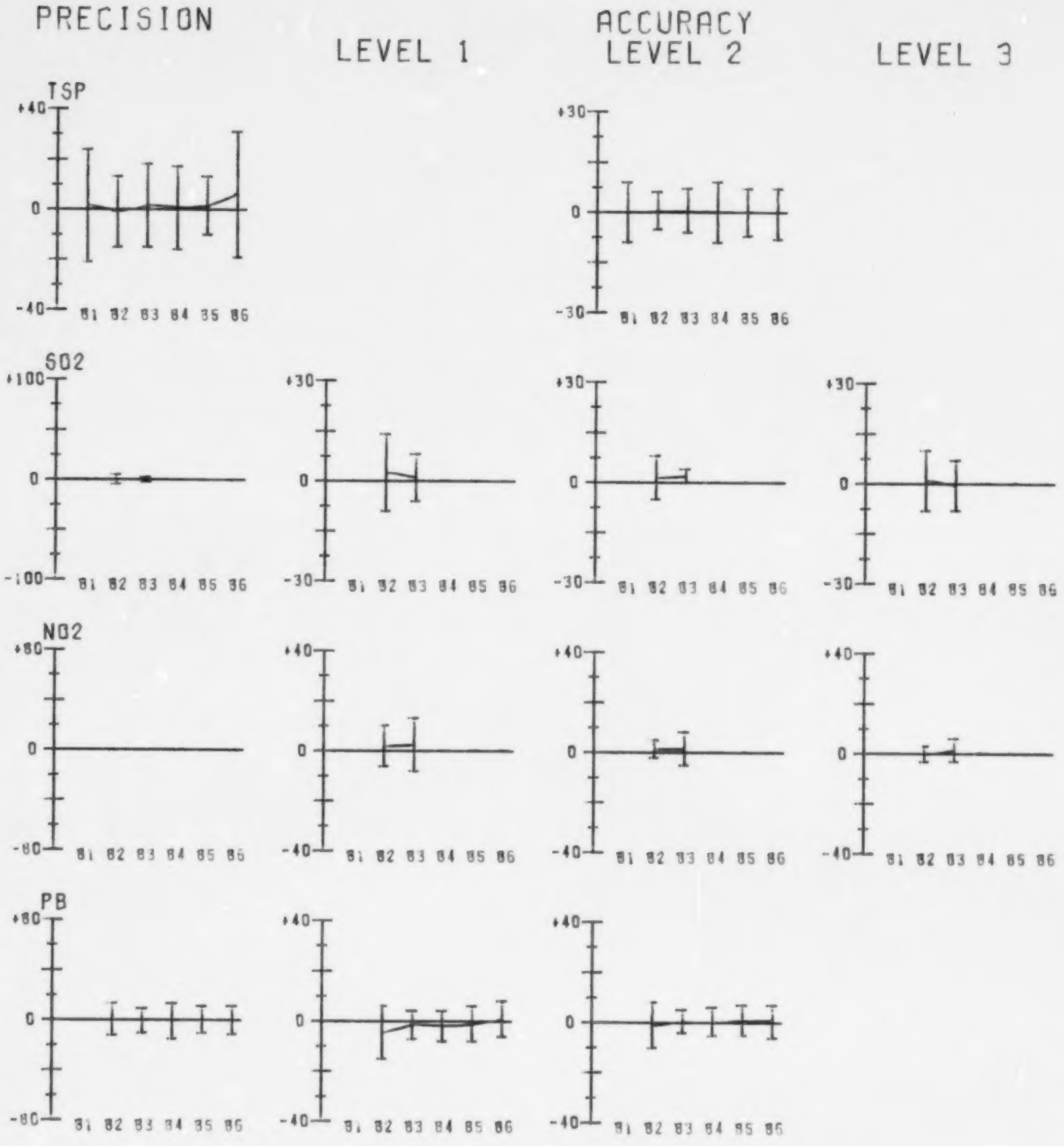
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 06
STATE : 32 NEW MEXICO
REPORG: 001 ENV. IMPROVEMENT DIV., SANTA FE



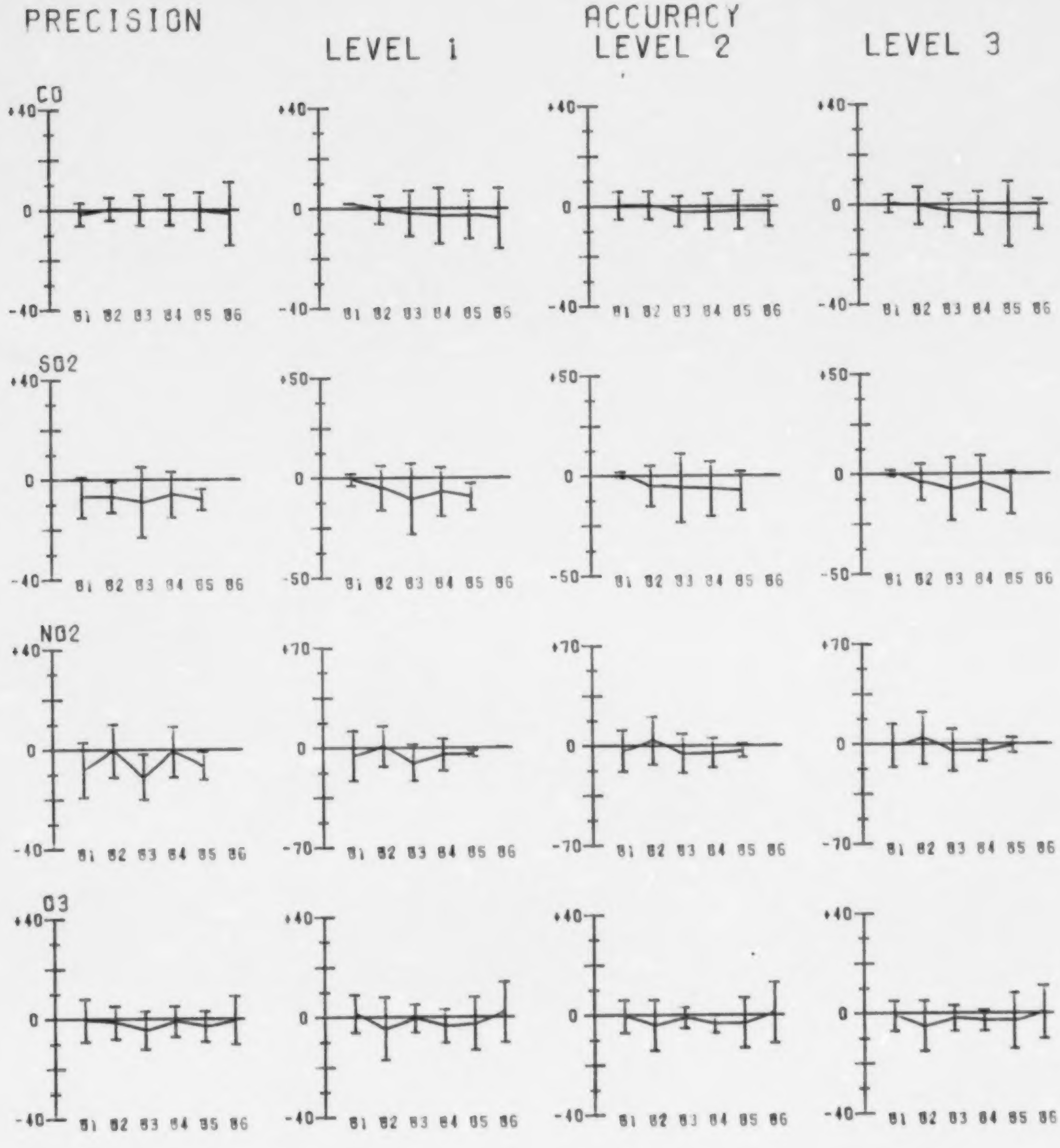
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 06
STATE : 32 NEW MEXICO
REPORG: 001 ENV. IMPROVEMENT DIV., SANTA FE



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 06
STATE : 32 NEW MEXICO
REPORG : 002 CITY OF ALBUQUERQUE ENV. HEALTH DIV.



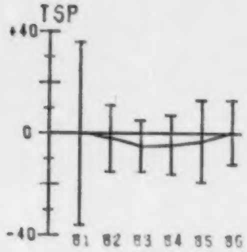
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

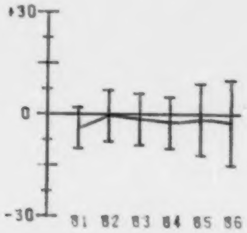
REG : 06
STATE : 32 NEW MEXICO
REPORG: 002 CITY OF ALBUQUERQUE ENV. HEALTH DIV.

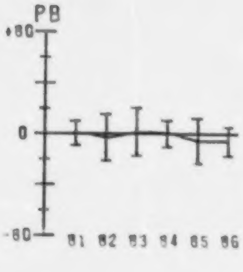
PRECISION

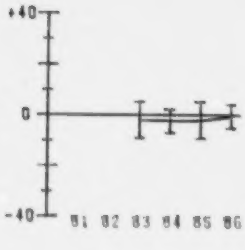
ACCURACY

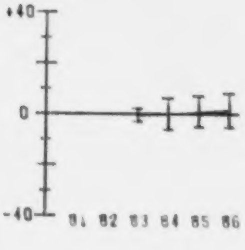
LEVEL 1 LEVEL 2 LEVEL 3





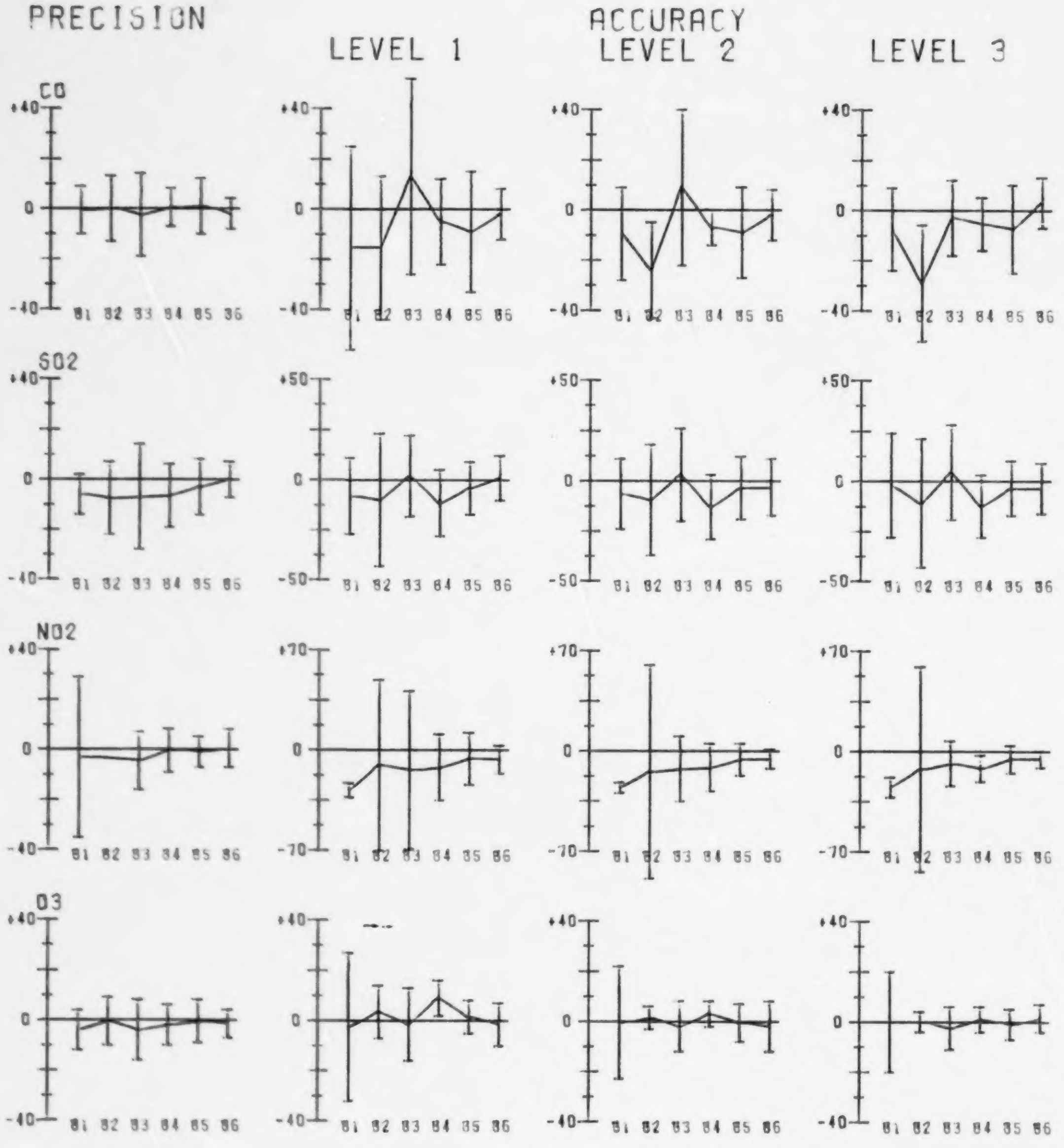






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 06
STATE : 37 OKLAHOMA
REPORG: 101 OK STATE DEPT. OF HEALTH



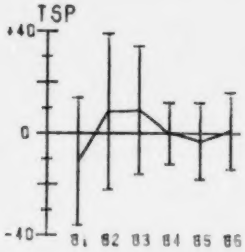
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

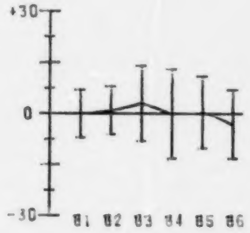
REG   : 06
STATE : 37 OKLAHOMA
REPORG: 101 OK STATE DEPT. OF HEALTH

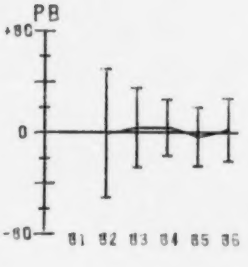
PRECISION

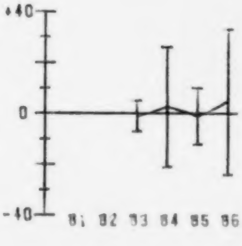
ACCURACY

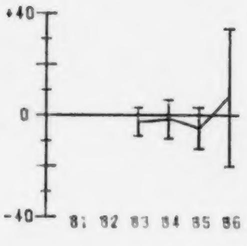
LEVEL 1   LEVEL 2   LEVEL 3







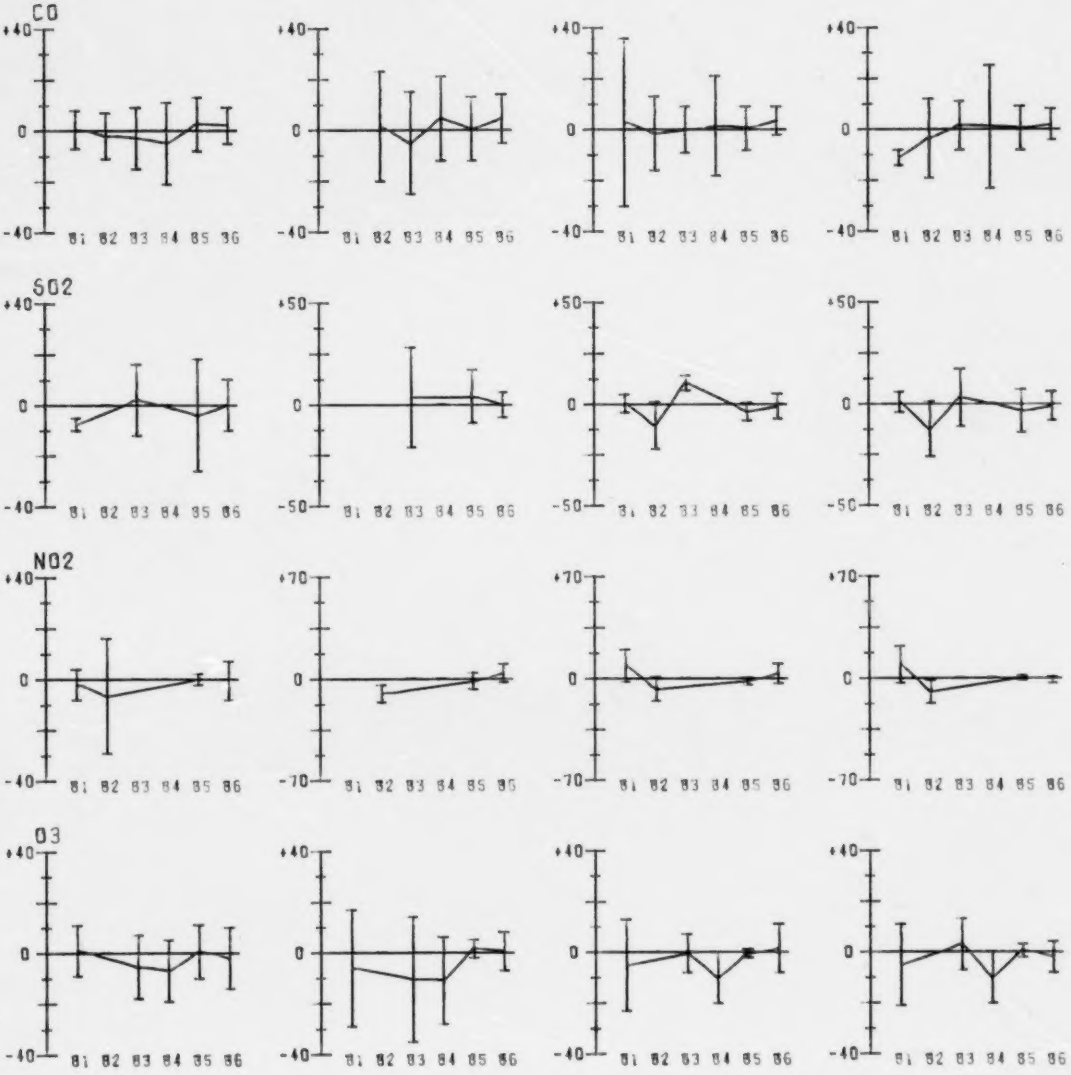




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 06
STATE : 37 OKLAHOMA
REPORG: 102 OKLAHOMA CITY-CNTY. HEALTH DEPT.

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 06
STATE : 37 OKLAHOMA
REPORG: 102 OKLAHOMA CITY-CNTY. HEALTH DEPT.

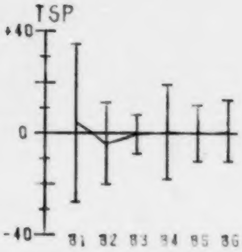
PRECISION

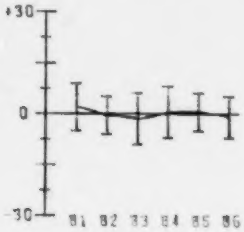
ACCURACY

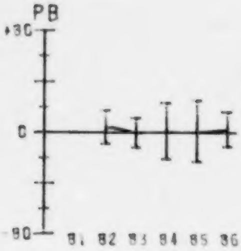
LEVEL 1

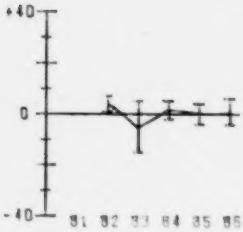
LEVEL 2

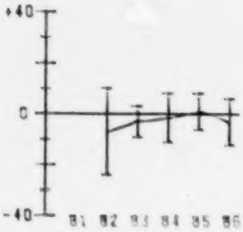
LEVEL 3







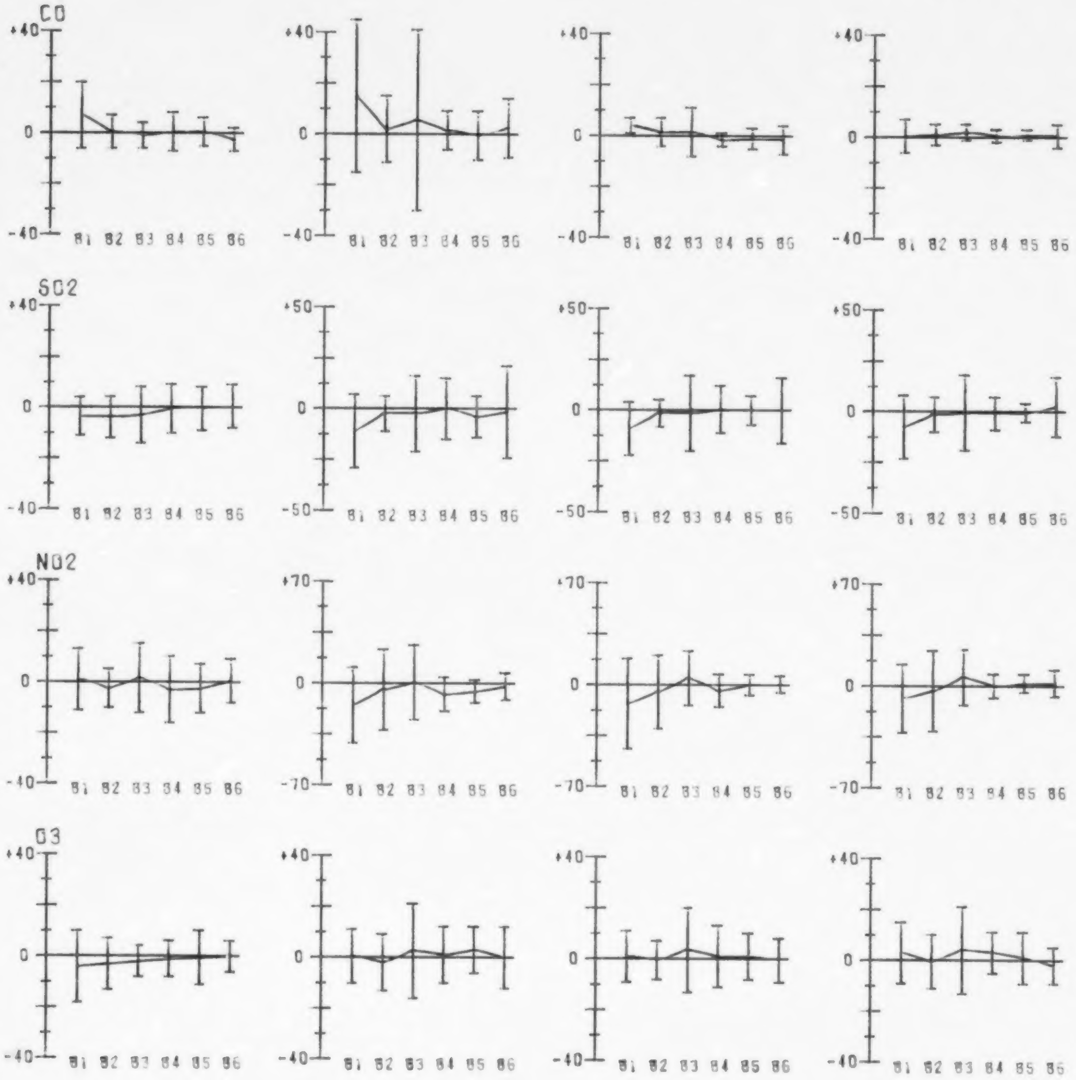




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 06
STATE : 37 OKLAHOMA
REPORG: 103 TULSA CITY-CNTY. HEALTH DEPT.

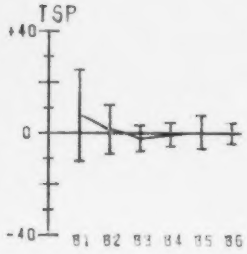
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3

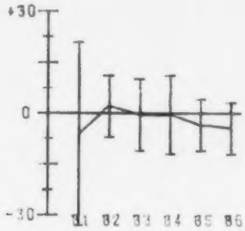


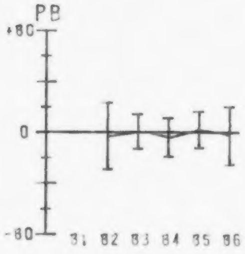
95% PROBABILITY LIMITS 81-85
MANUAL METHODS

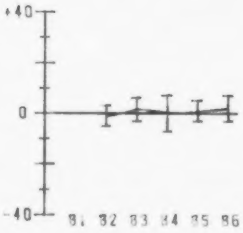
REG   : 05
STATE : 37 OKLAHOMA
REPORG: 103 TULSA CITY-CNTY. HEALTH DEPT.

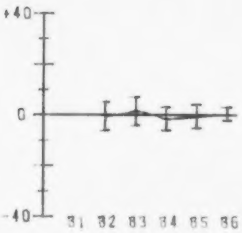
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





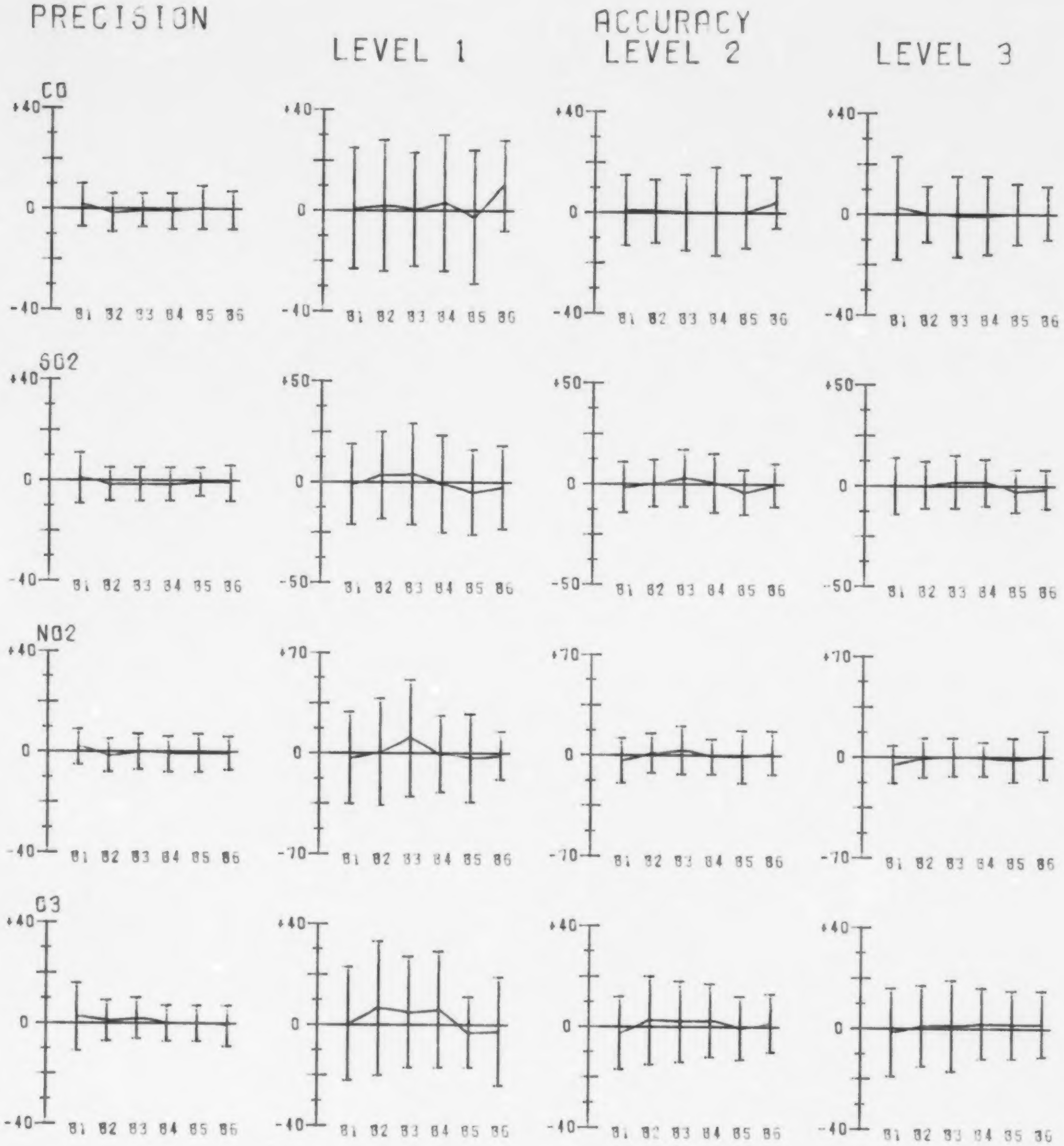






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 06
STATE : 45 TEXAS
REPORG: 001 TEXAS AIR CONTROL BOARD

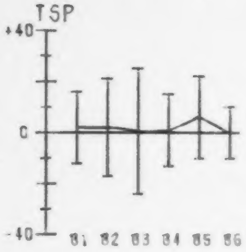


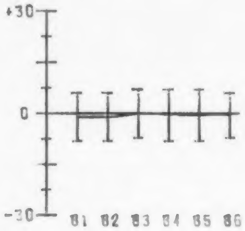
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

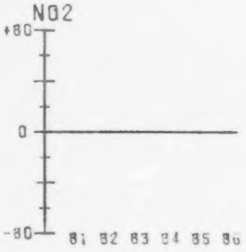
REG   : 06
STATE : 45 TEXAS
REPORG: 001 TEXAS AIR CONTROL BOARD

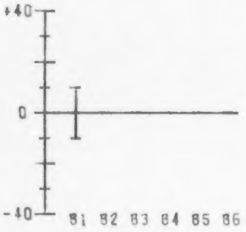
PRECISION

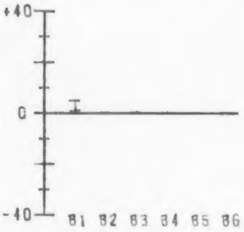
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

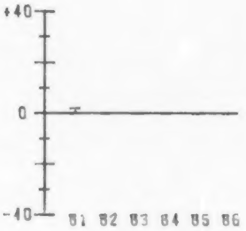


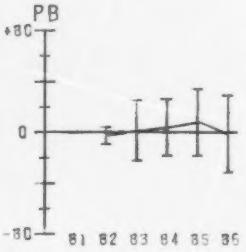


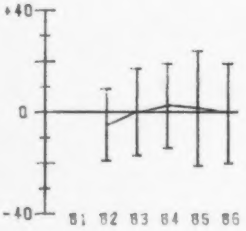


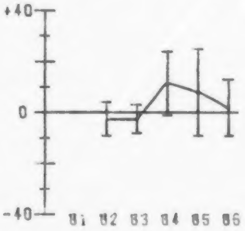




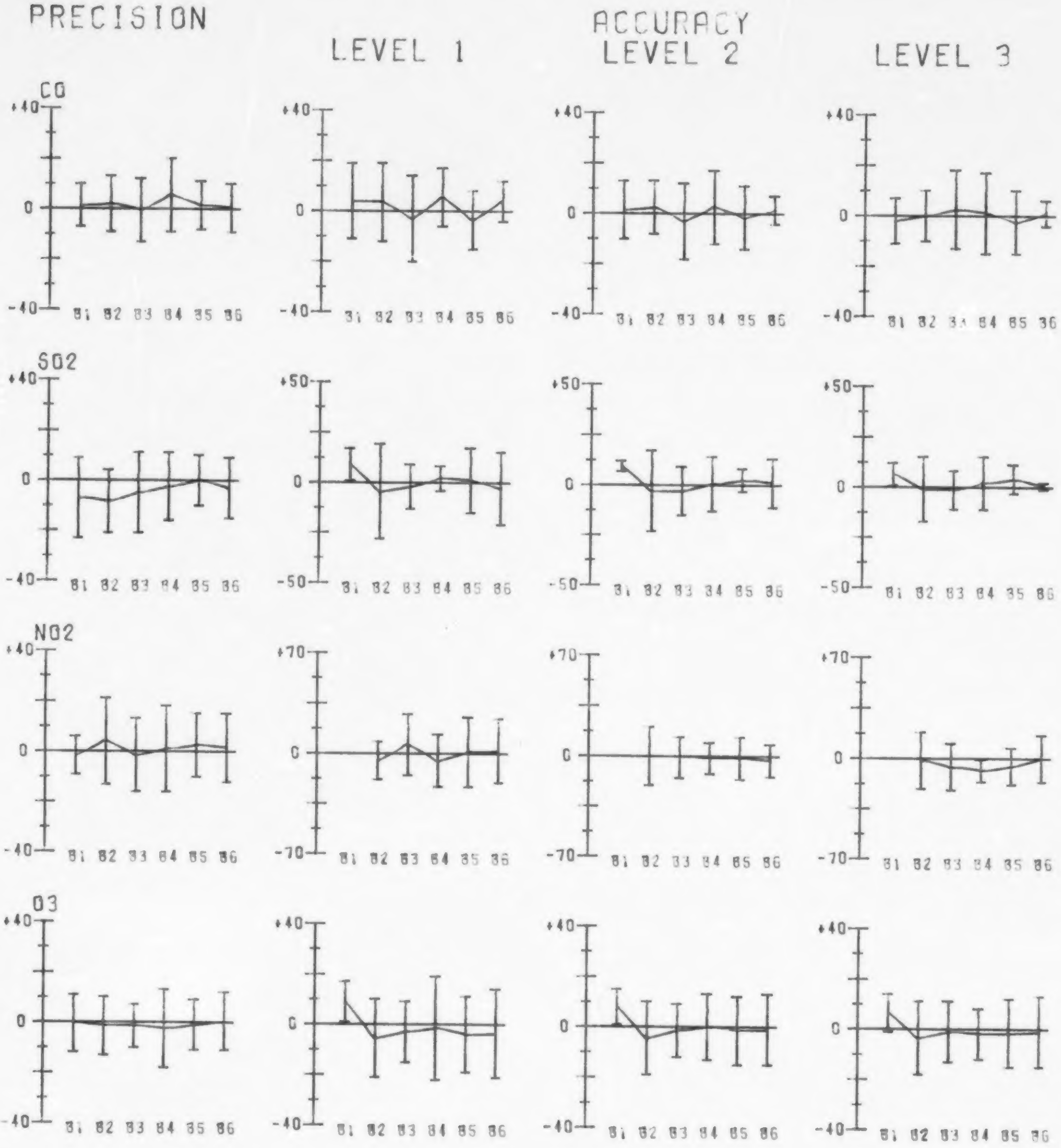








95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS
REG : 06
STATE : 45 TEXAS
REPORG: 002 DALLAS ENV. HEALTH & CONSERVATION DEPT.



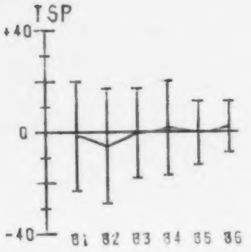
95% PROBABILITY LIMITS 81-85
MANUAL METHODS

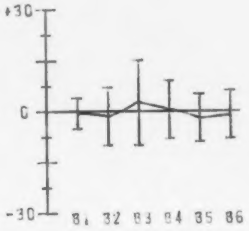
REG   : 06
STATE : 45 TEXAS
REPORG : 002 DALLAS ENV. HEALTH & CONSERVATION DEPT.

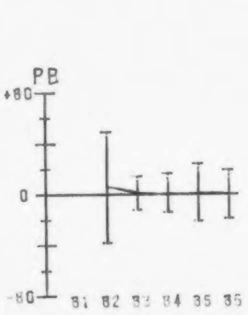
PRECISION

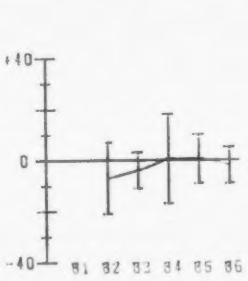
ACCURACY

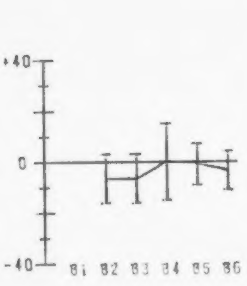
LEVEL 1   LEVEL 2   LEVEL 3





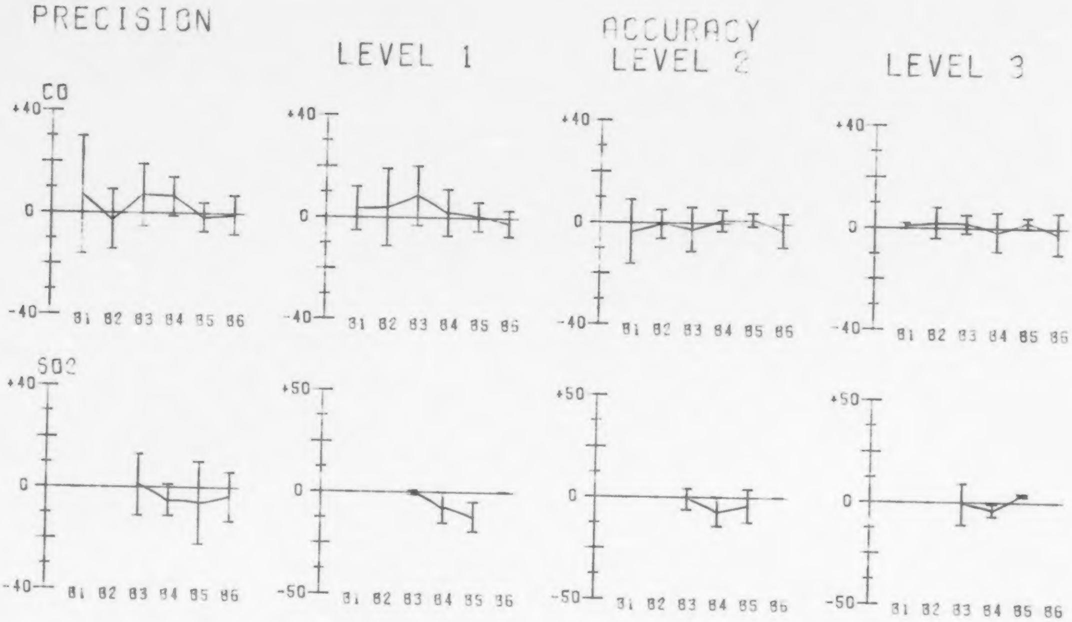






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 06
STATE : 45 TEXAS
REPORG: 003 EL PASO CITY-CNTY. HEALTH DEPT.



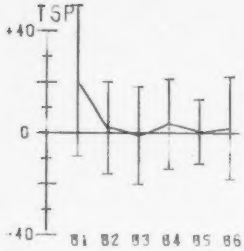
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

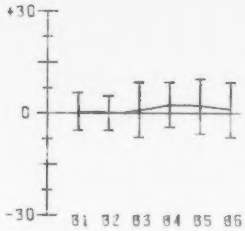
REG   : 06
STATE : 45 TEXAS
REPORG: 003 EL PASO CITY-CNTY. HEALTH DEPT.

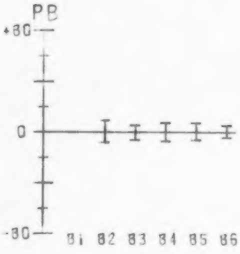
PRECISION

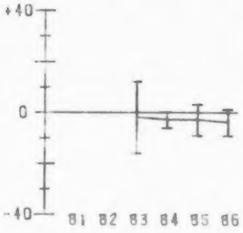
ACCURACY

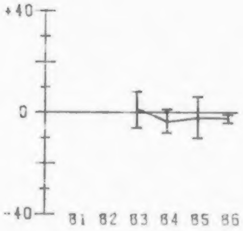
LEVEL 1   LEVEL 2   LEVEL 3











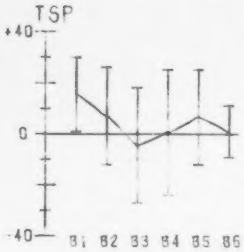
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

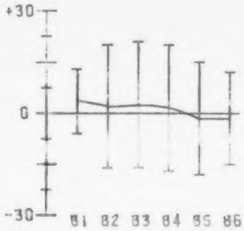
REG : 06
STATE : 45 TEXAS
REPORG: 004 FT. WORTH PUBLIC HEALTH DEPT.

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



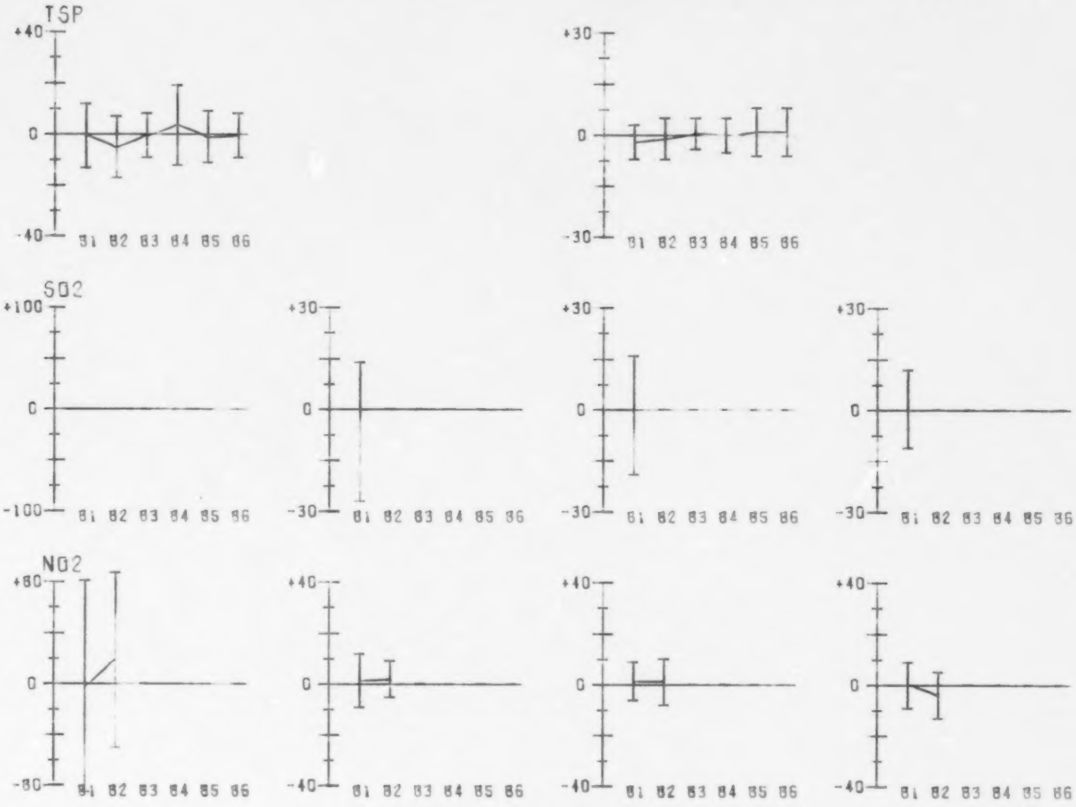


95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 06
STATE : 45 TEXAS
REPORG: 005 GALVESTON COUNTY HEALTH DISTRICT

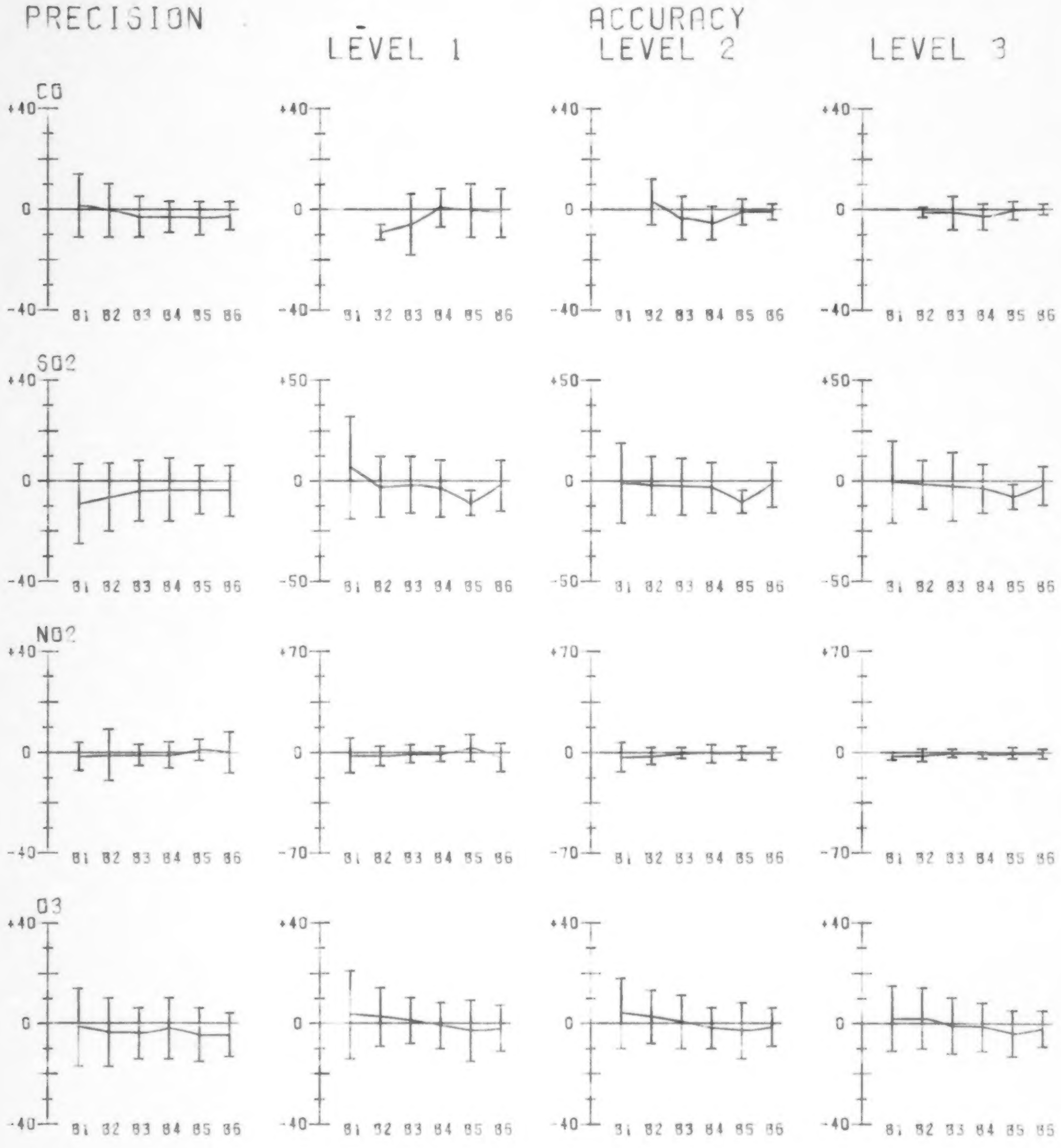
PRECISION

ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



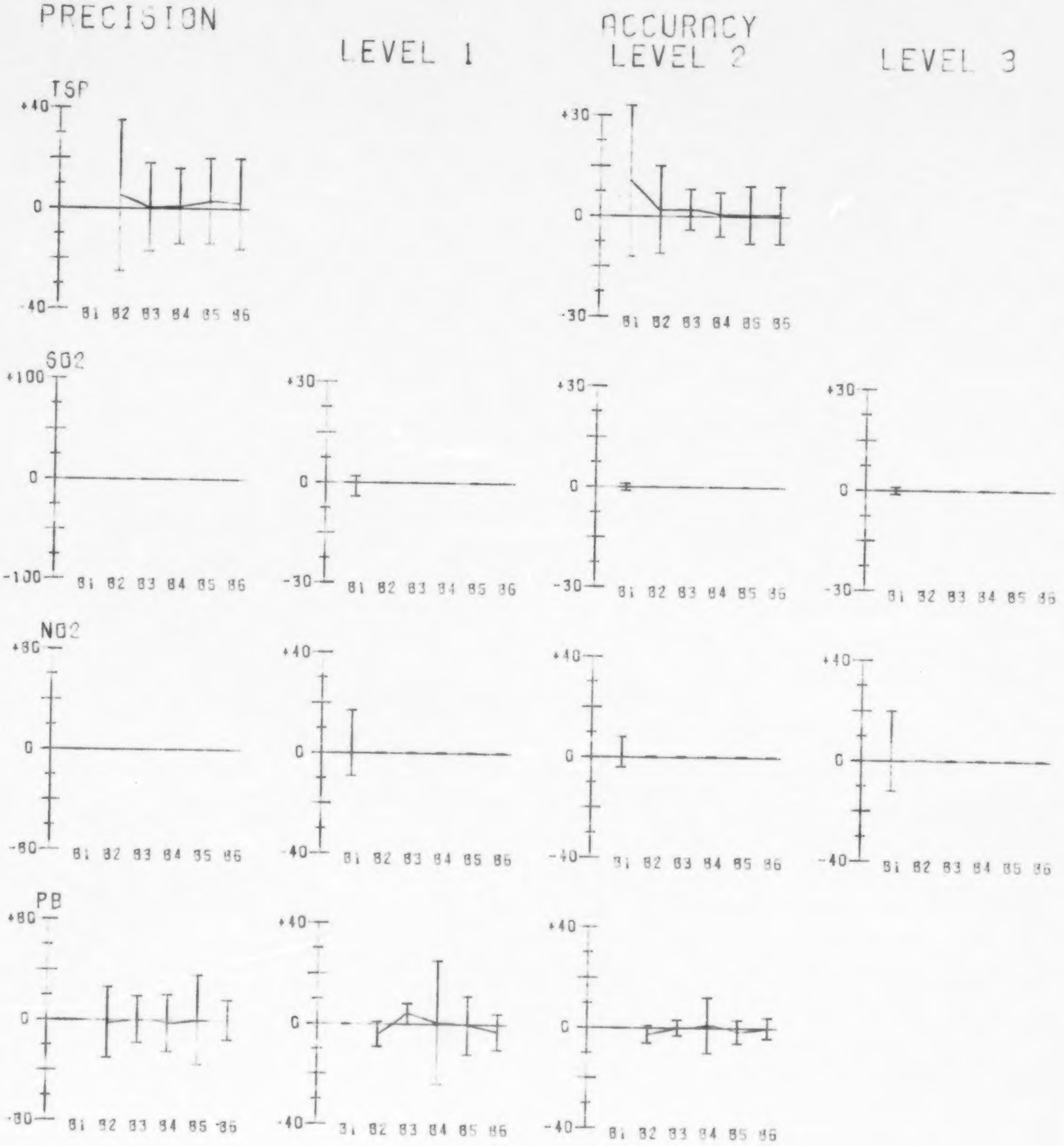
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05
STATE : 45 TEXAS
REPORG: 006 HOUSTON DEPT. OF PUBLIC HEALTH



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 06
STATE : 45 TEXAS
REPORG: 006 HOUSTON DEPT. OF PUBLIC HEALTH



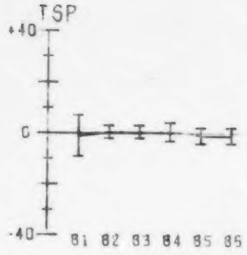
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

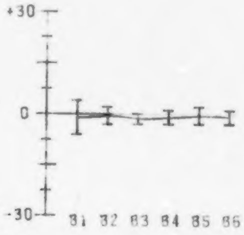
REG : 06
STATE : 45 TEXAS
REPORG: 007 SAN ANTONIO METRO. HEALTH DISTRICT

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3



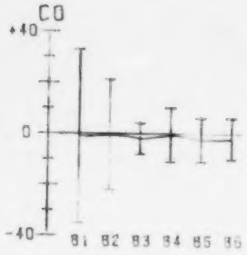


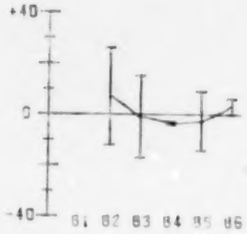
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

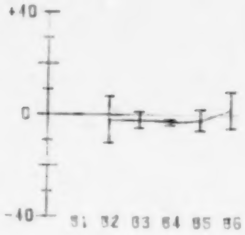
REG : 07
STATE : 16 IOWA
REPORG: 001 POLK COUNTY PHYSICAL PLANNING

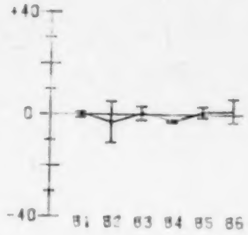
PRECISION

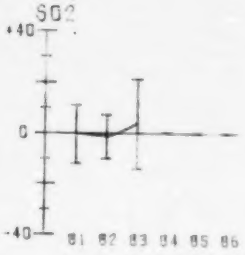
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3

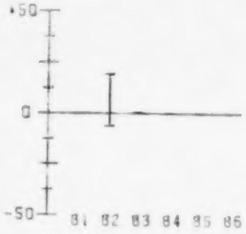


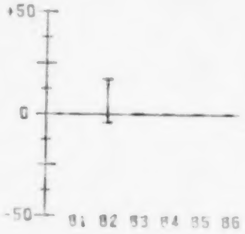


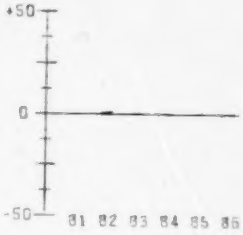


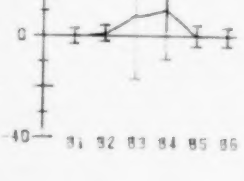


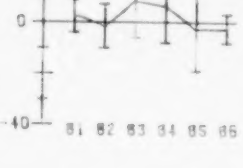


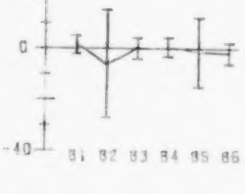


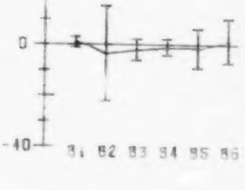










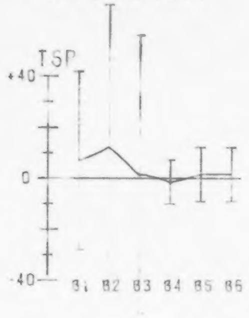


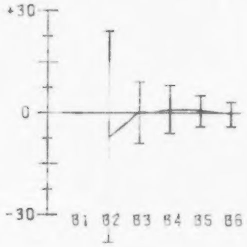
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 07
STATE : 15 IOWA
REPORG: 001 POLK COUNTY PHYSICAL PLANNING

PRECISION LEVEL 1

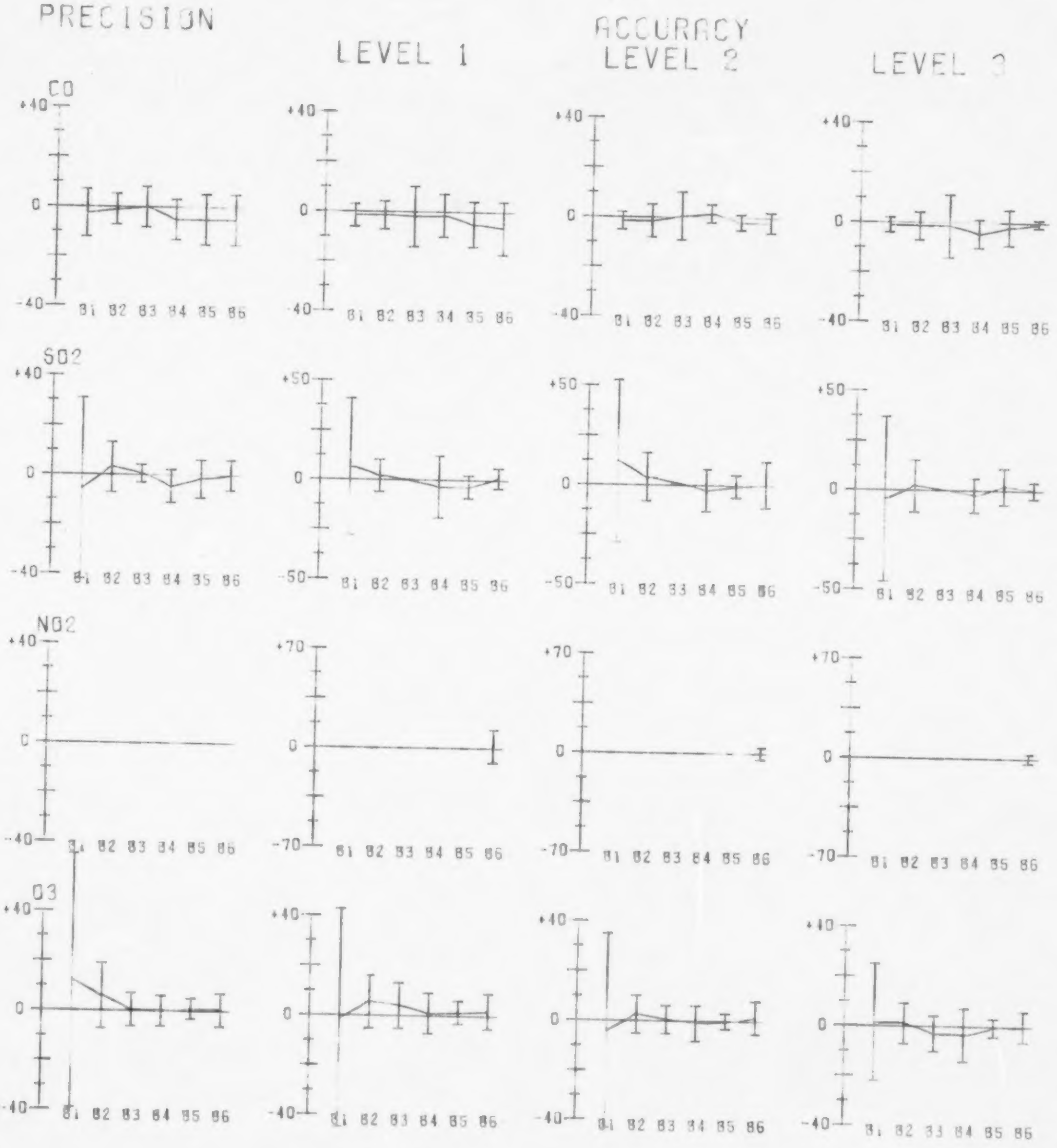
ACCURACY LEVEL 2 LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 07
STATE : 16 IOWA
REPORG: 002 LINN COUNTY HEALTH DEPARTMENT



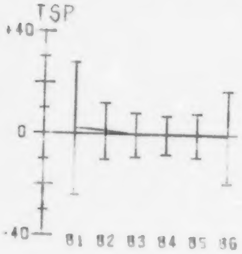
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

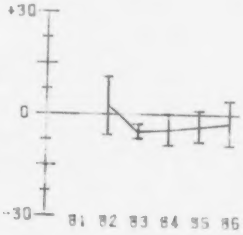
REG : 07
STATE : 15 IOWA
REPORG: 002 LINN COUNTY HEALTH DEPARTMENT

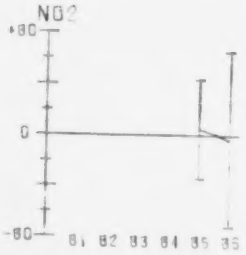
PRECISION

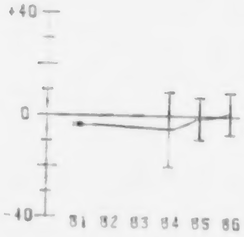
ACCURACY

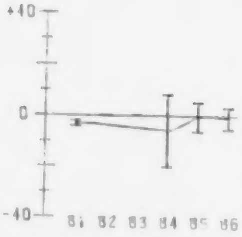
LEVEL 1 LEVEL 2 LEVEL 3

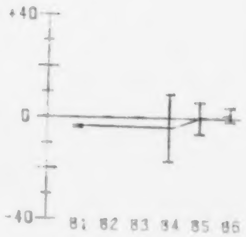






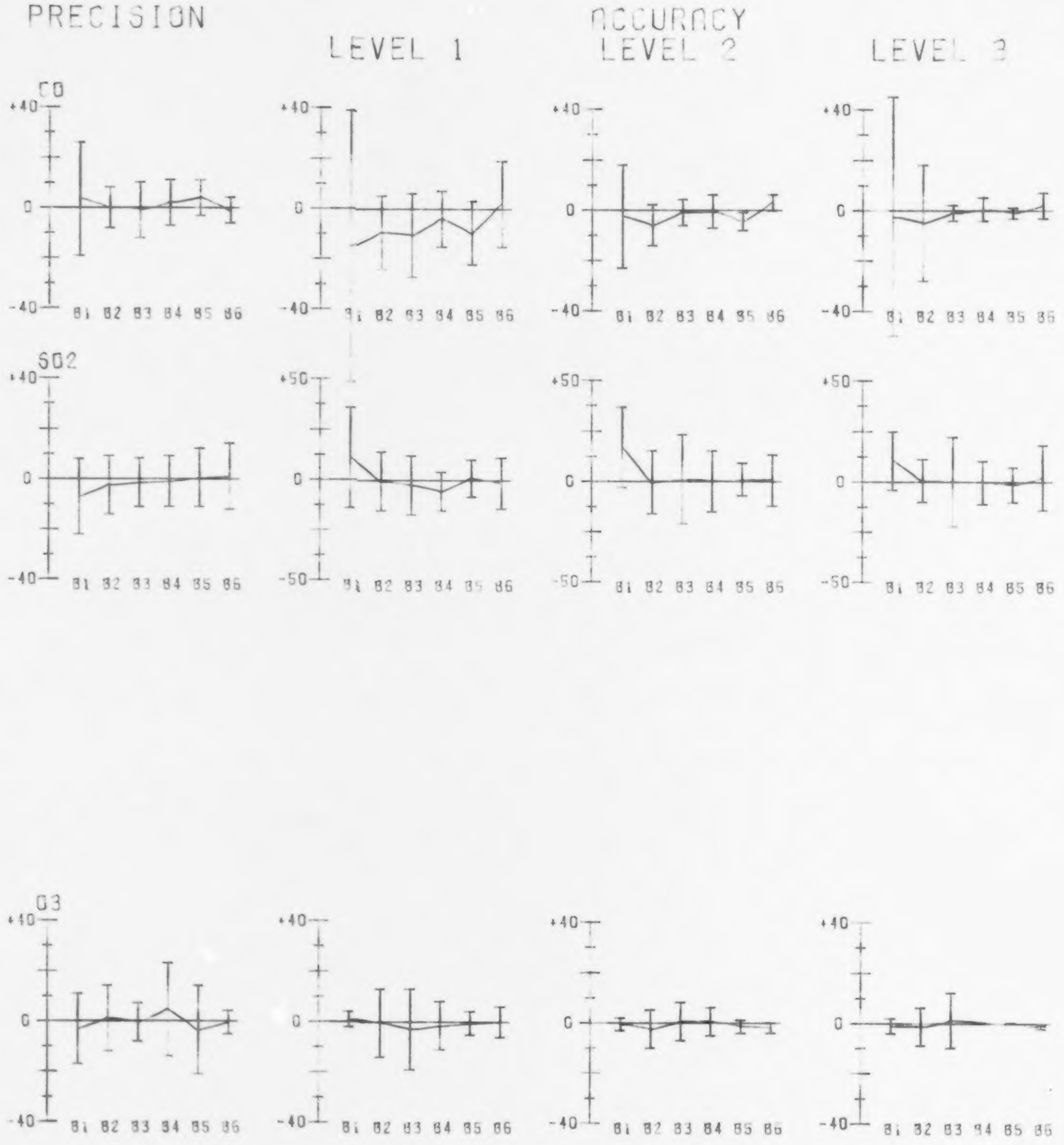






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 07
STATE : 15 IOWA
REPORG: 003 UNIVERSITY HYGIENIC LABORATORY



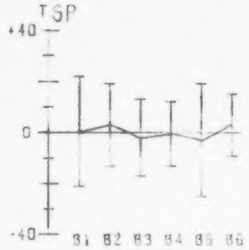
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

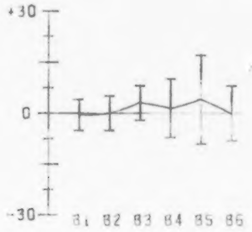
REG   : 07
STATE : 16 IOWA
REPORG: 003 UNIVERSITY HYGIENIC LABORATORY

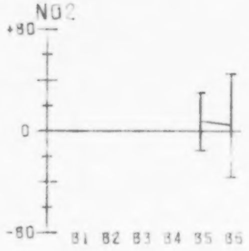
PRECISION

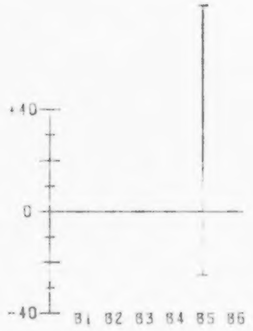
ACCURACY

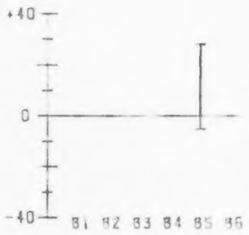
LEVEL 1   LEVEL 2   LEVEL 3

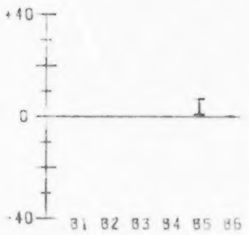


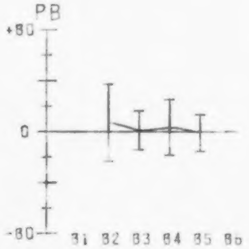


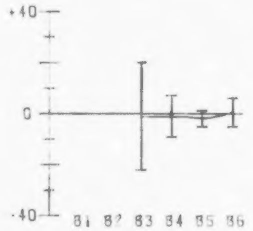


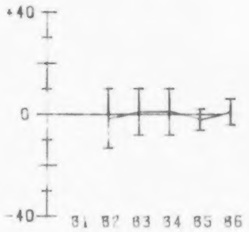






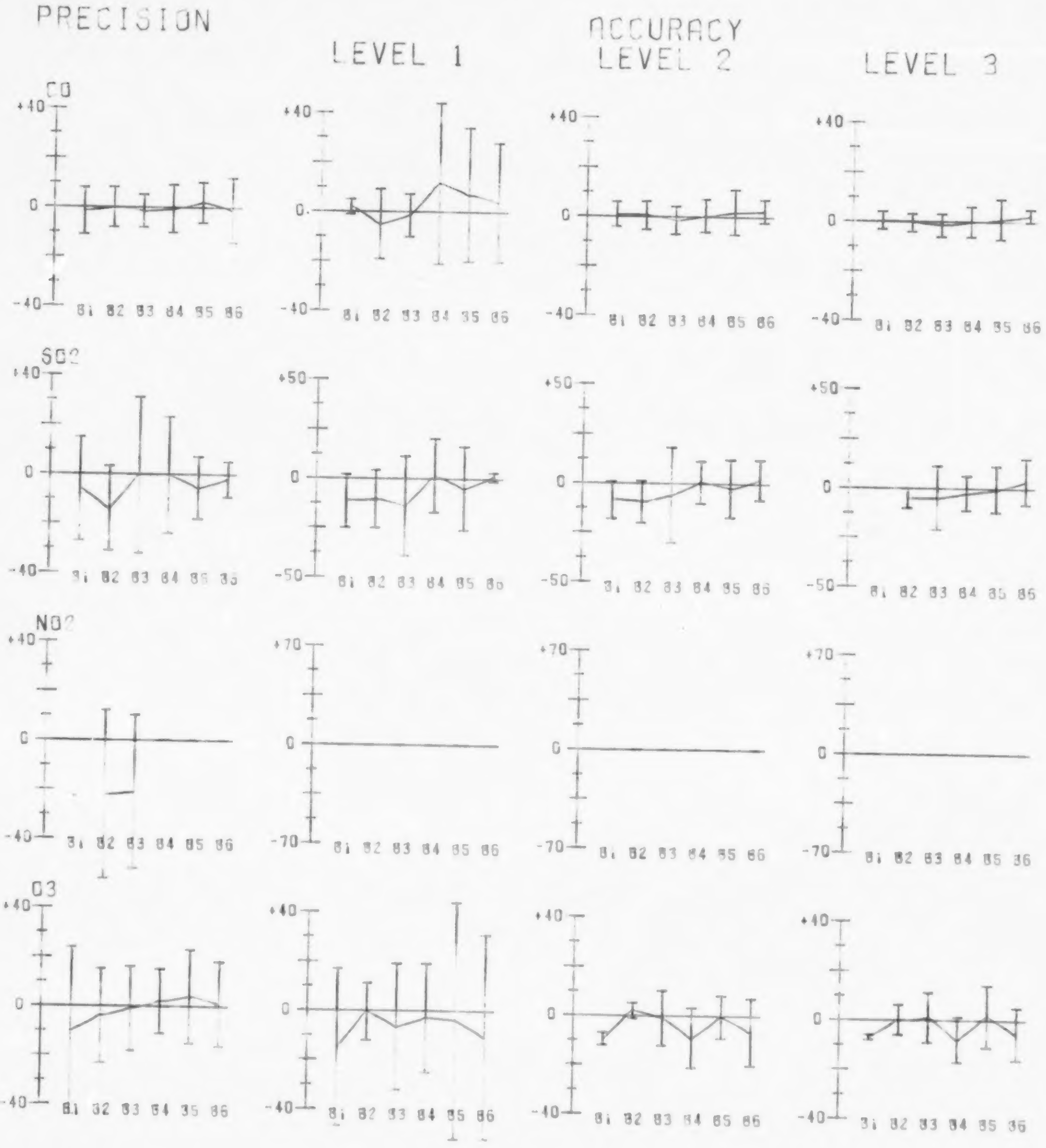






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

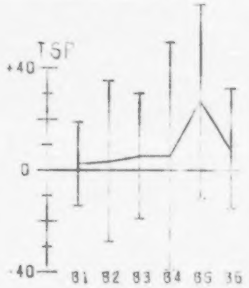
REG : 07
STATE : 17 KANSAS
REPORG: 001 STATE OF KANSAS

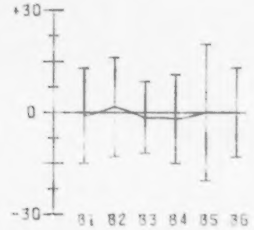


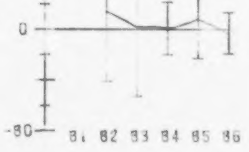
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

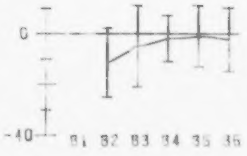
REG   : 07
STATE : 17 KANSAS
REPORG: 001 STATE OF KANSAS

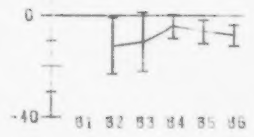
PRECISION   LEVEL 1   ACCURACY
                                    LEVEL 2   LEVEL 3





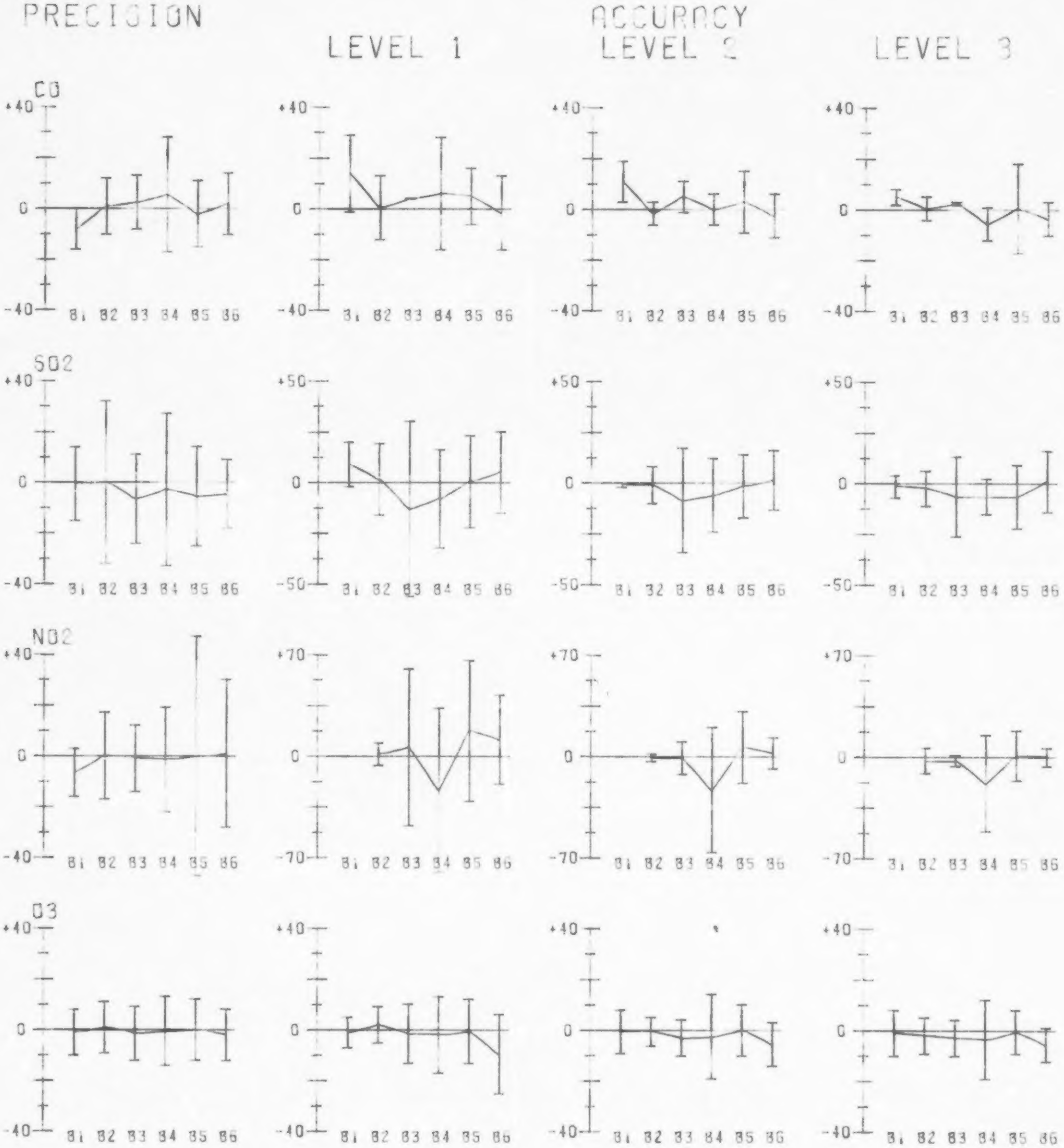






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 07
STATE : 25   MISSOURI
REPORG: 001 LABORATORY SERVICES PROGRAM



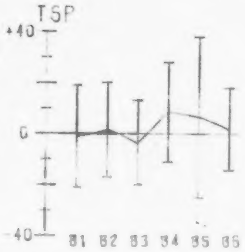
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

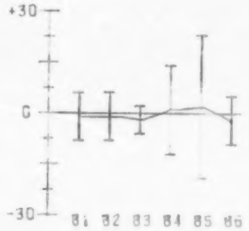
REG : 07
STATE : 26 MISSOURI
REPORG: 001 LABORATORY SERVICES PROGRAM

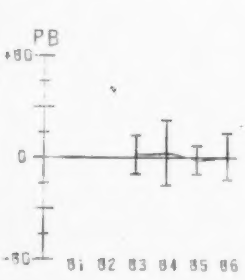
PRECISION

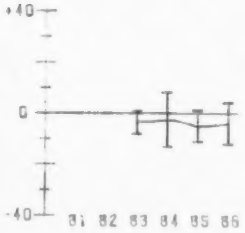
ACCURACY

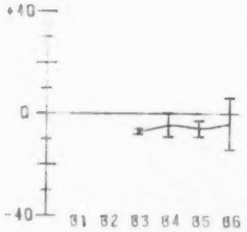
LEVEL 1 LEVEL 2 LEVEL 3





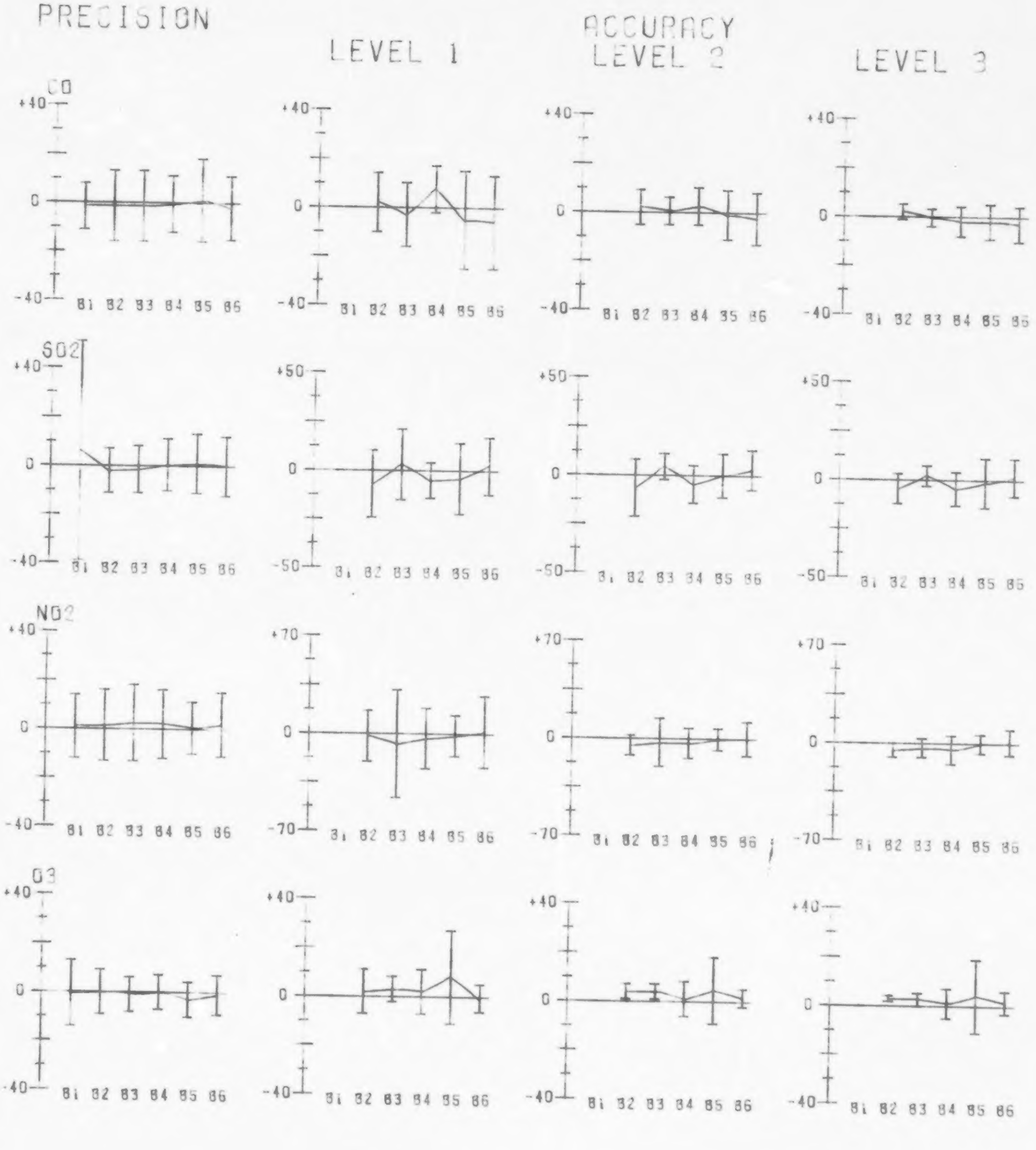






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 07
STATE : 26 MISSOURI
REPORG: 002 ST. LOUIS COUNTY

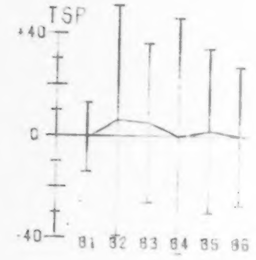


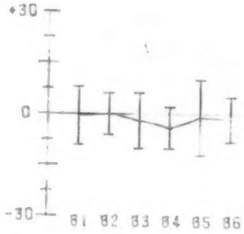
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

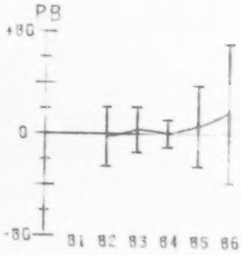
REG   : 07
STATE : 25 MISSOURI
REPORG: 002 ST. LOUIS COUNTY

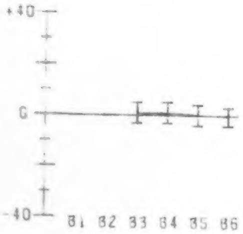
PRECISION

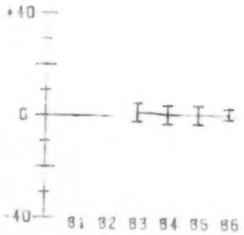
ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3











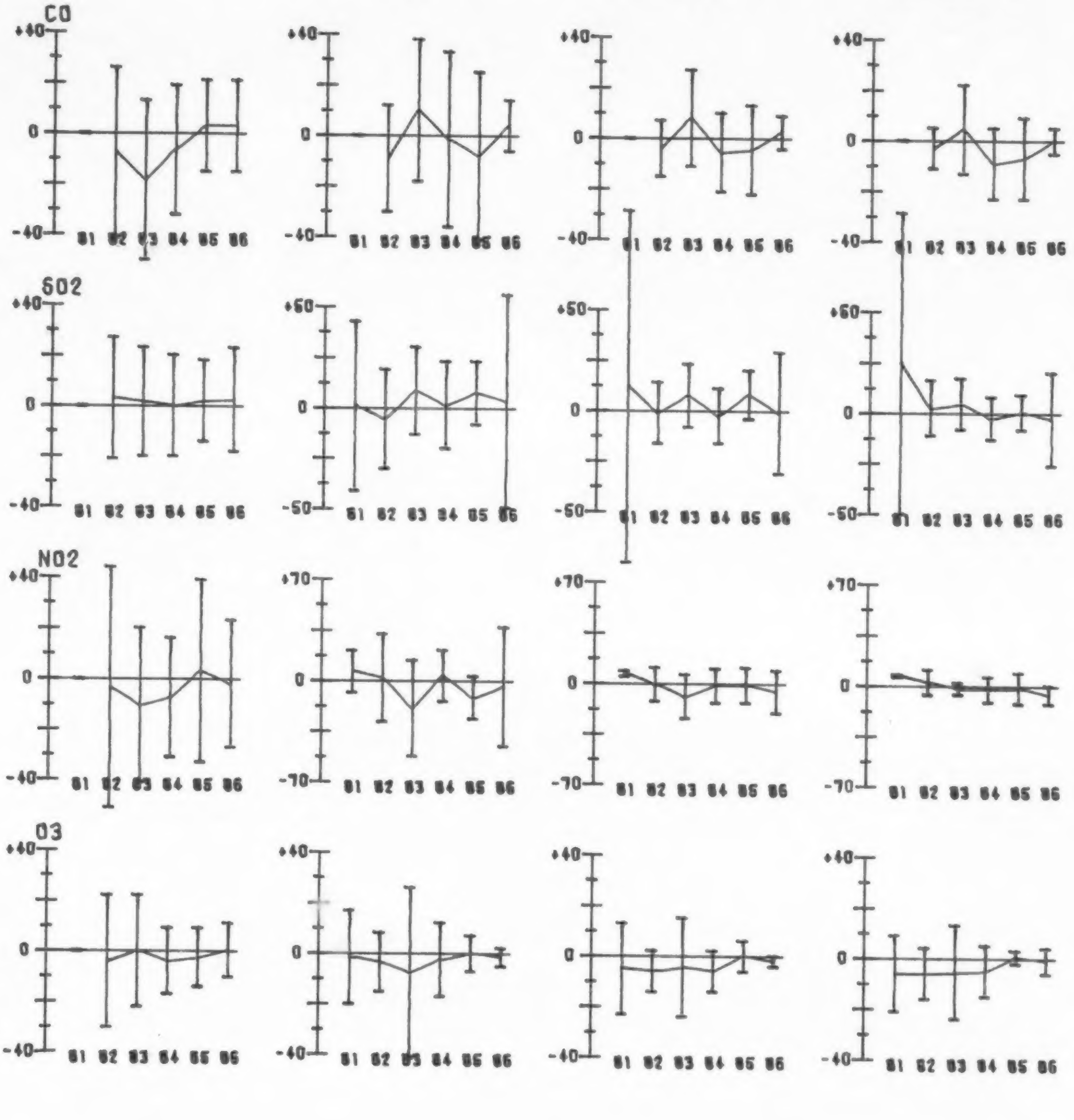
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 07
STATE : 26 MISSOURI
REPORG: 003 ST. LOUIS CITY

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 07
STATE : 26 MISSOURI
REPORG: 003 ST. LOUIS CITY

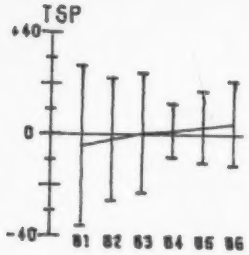
PRECISION

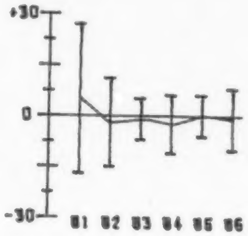
ACCURACY

LEVEL 1

LEVEL 2

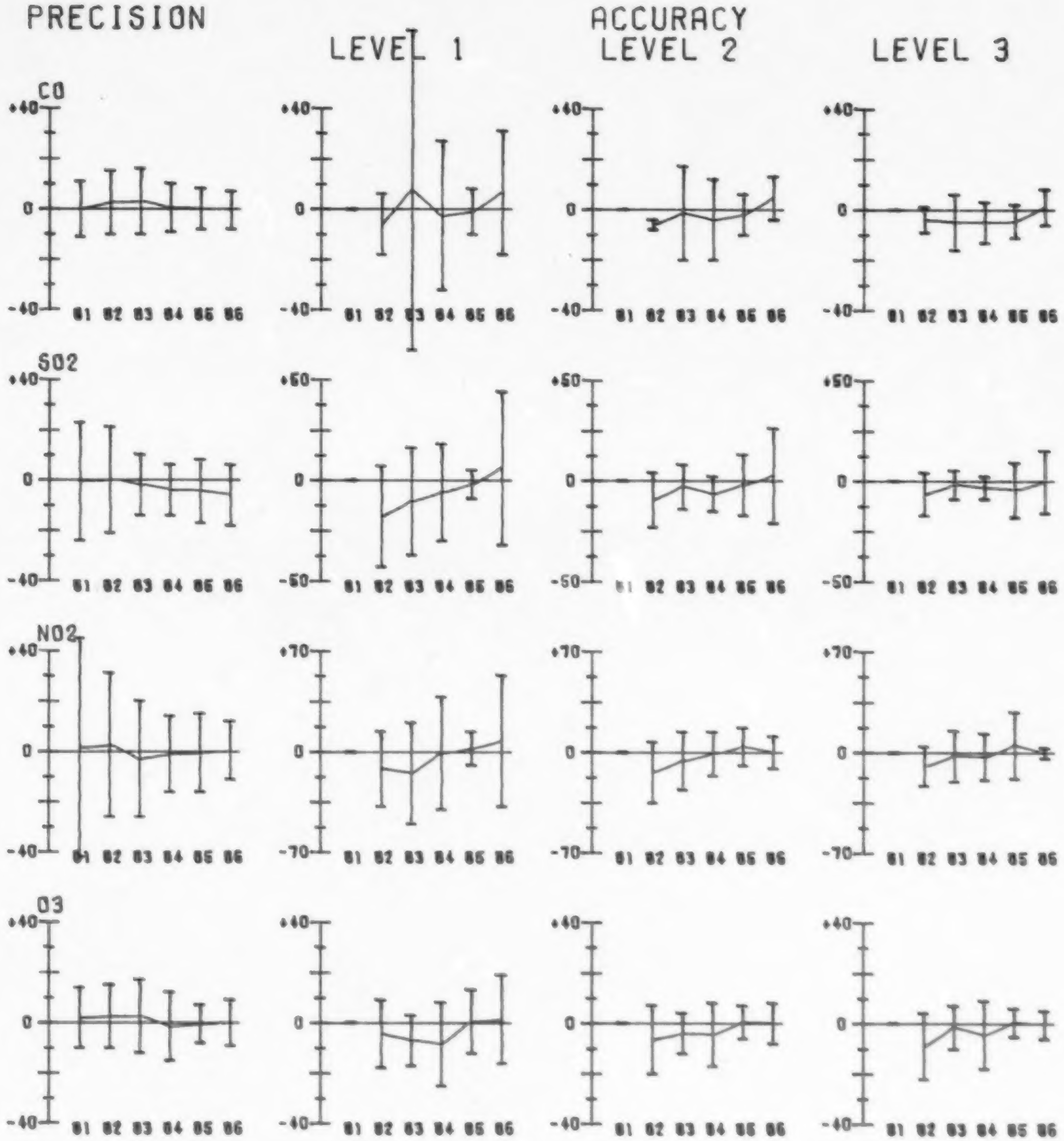
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

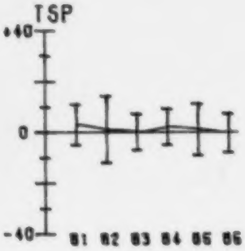
REG   : 07
STATE : 26 MISSOURI
REPORG: 004 KANSAS CITY

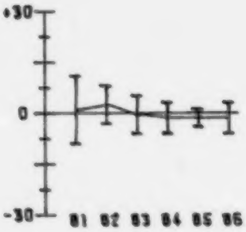


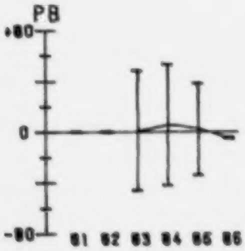
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

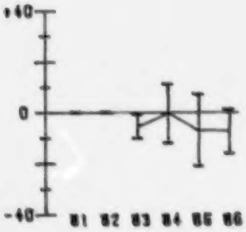
REG   : 07
STATE : 26 MISSOURI
REPORG: 004 KANSAS CITY

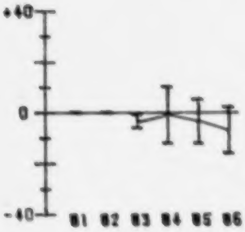
PRECISION   LEVEL 1   ACCURACY LEVEL 2   LEVEL 3





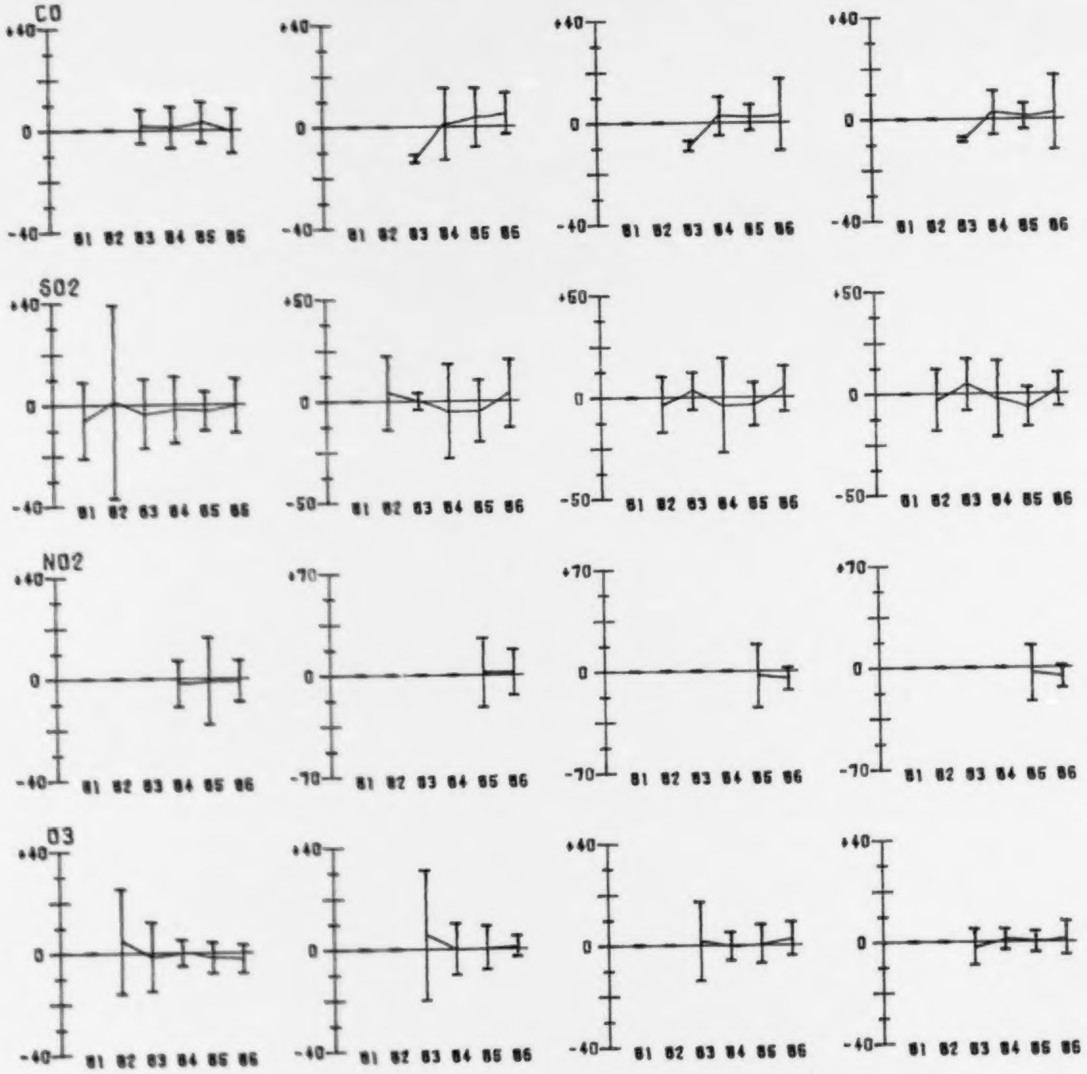






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 07
STATE : 26 MISSOURI
REPORG : 005 SPRINGFIELD



PRECISION

ACCURACY

LEVEL 1

LEVEL 2

LEVEL 3

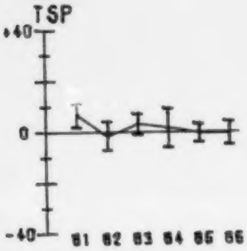
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

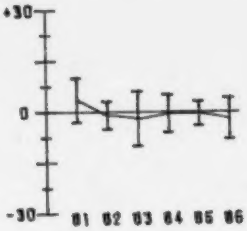
REG : 07
STATE : 26 MISSOURI
REPORG: 005 SPRINGFIELD

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3





95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 07
STATE : 26 MISSOURI
REPORG: 006 AMAX LEAD COMPANY OF MISSOURI, BOSS, MO

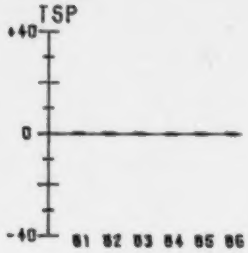
PRECISION

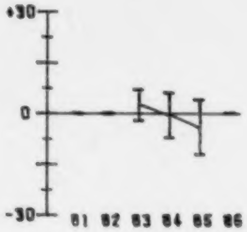
ACCURACY

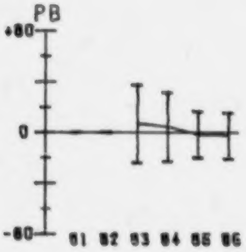
LEVEL 1

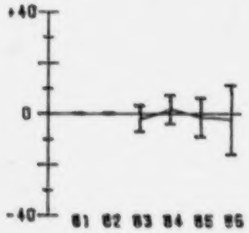
LEVEL 2

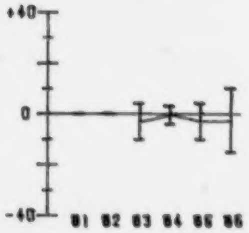
LEVEL 3







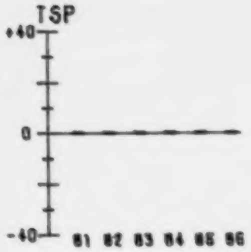


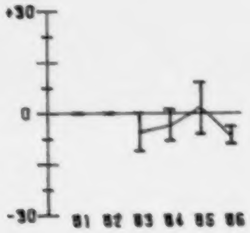


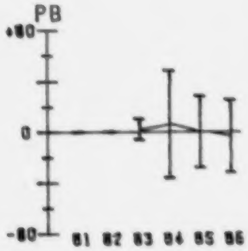
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

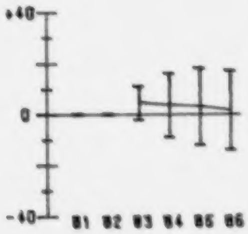
REG   : 07
STATE : 26 MISSOURI
REPORG: 007 ST. JOE LEAD COMPANY, HERCULANEUM, MO

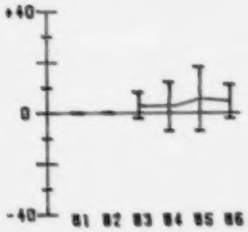
PRECISION   LEVEL 1   ACCURACY LEVEL 2   LEVEL 3











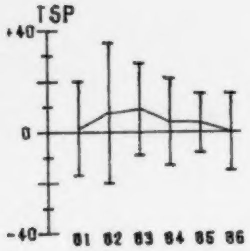
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

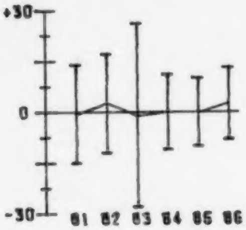
REG   : 07
STATE : 28   NEBRASKA
REPORG: 001 STATE OF NEBRASKA

PRECISION

ACCURACY

LEVEL 1   LEVEL 2   LEVEL 3

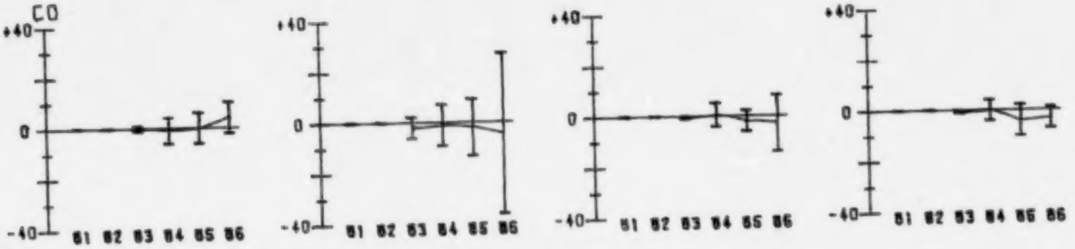


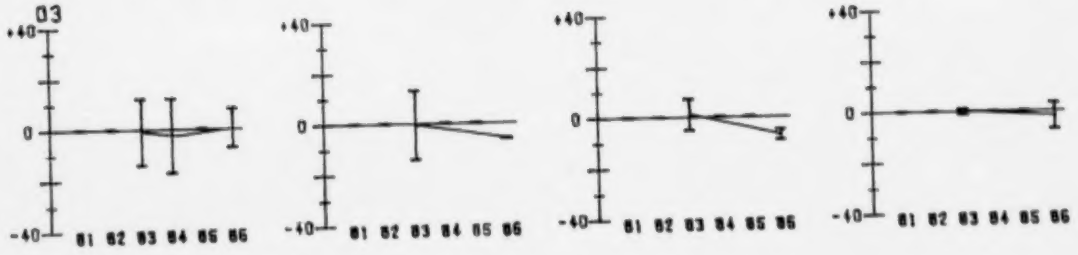


95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 07
STATE : 28 NEBRASKA
REPORG : 002 LINCOLN

PRECISION
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3





95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 07
STATE : 28 NEBRASKA
REPORG: 002 LINCOLN

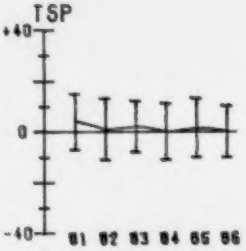
PRECISION

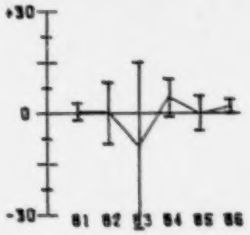
ACCURACY

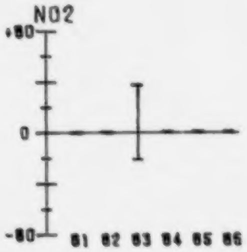
LEVEL 1

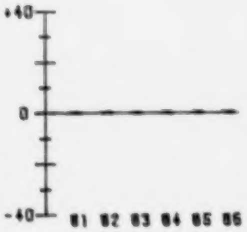
LEVEL 2

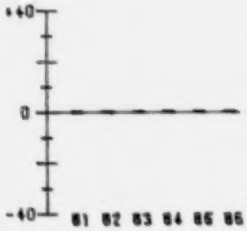
LEVEL 3

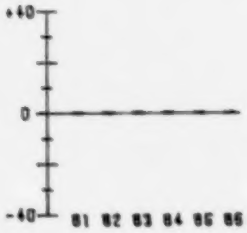








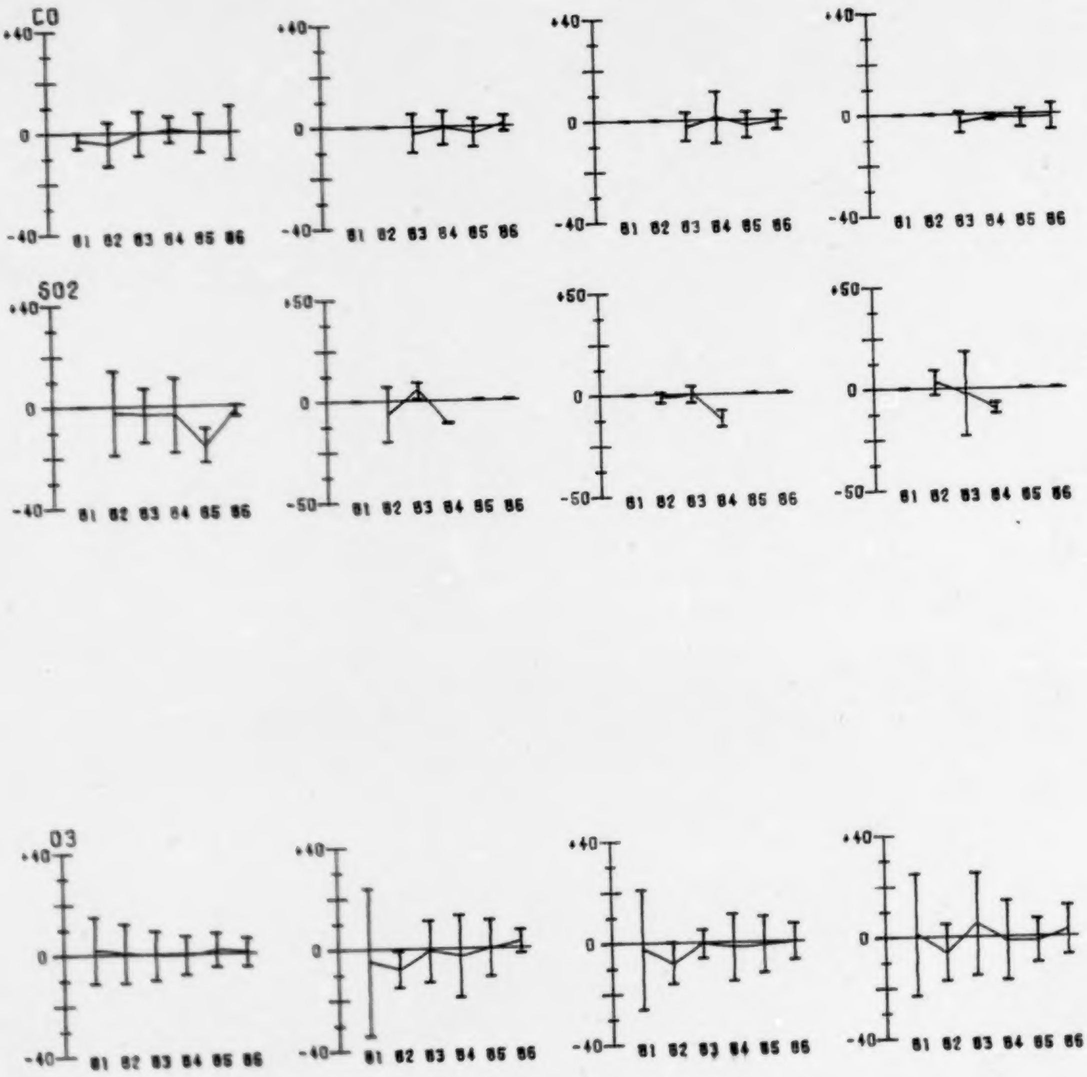




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

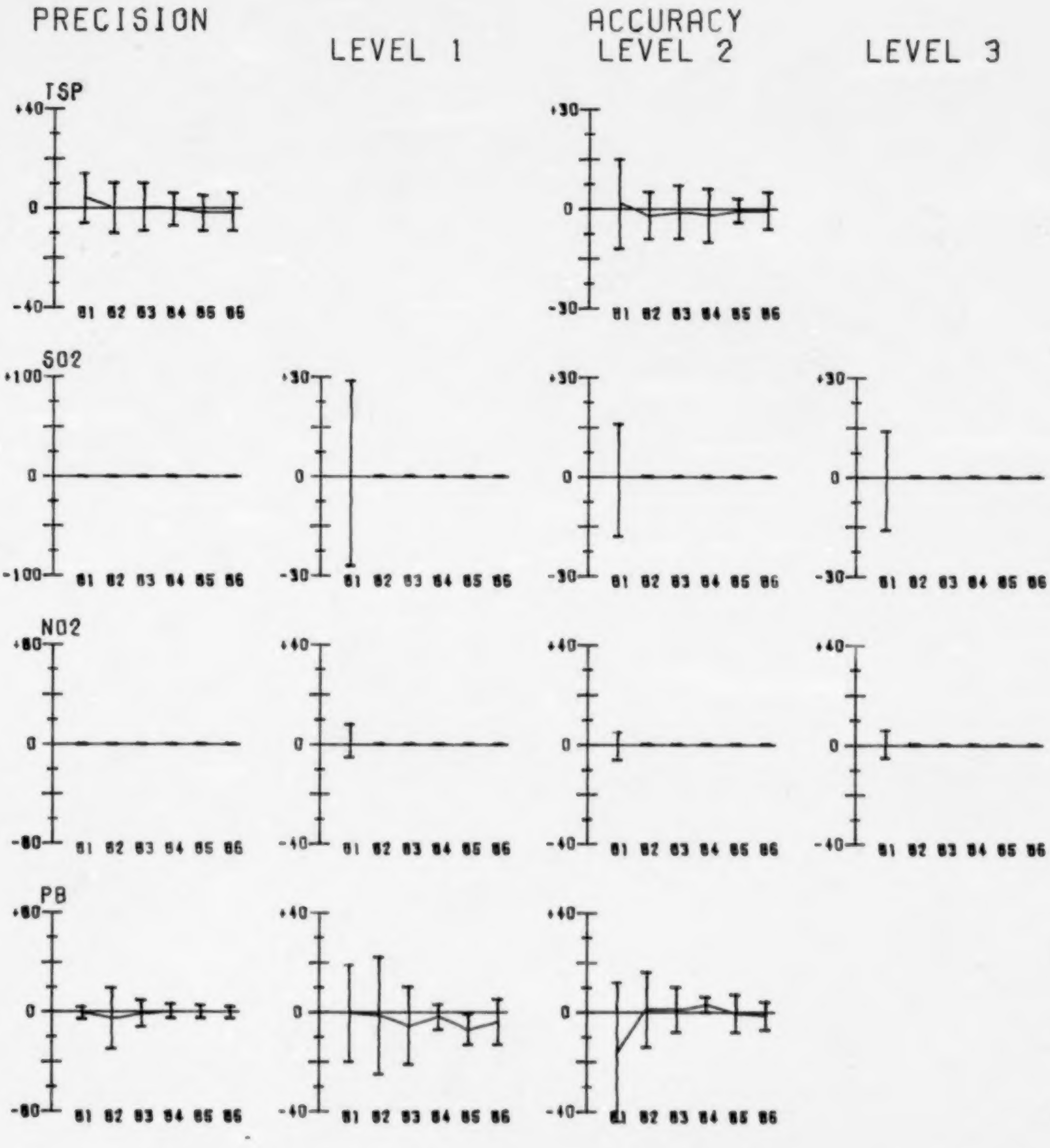
REG   : 07
STATE : 28 NEBRASKA
REPORG : 003 OMAHA

PRECISION | LEVEL 1 | ACCURACY LEVEL 2 | LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

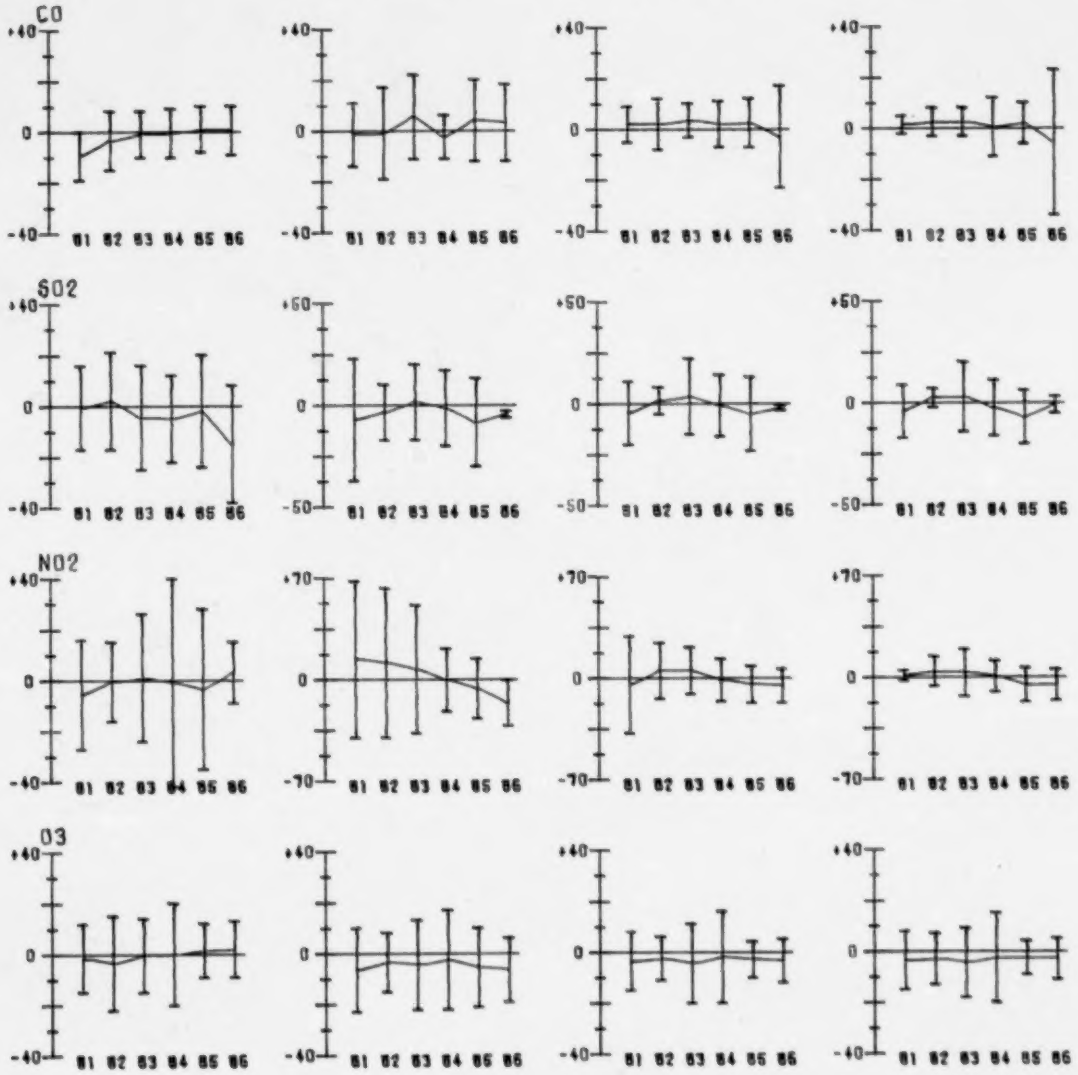
REG : 07
STATE : 28 NEBRASKA
REPORG: 003 OMAHA



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 08
STATE : 06 COLORADO
REPORG: 001 DEPARTMENT OF HEALTH

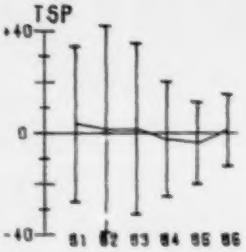
PRECISION ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3

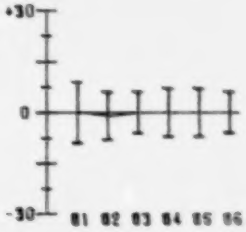


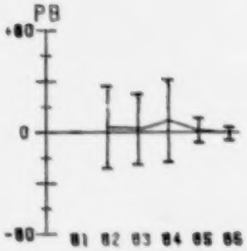
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

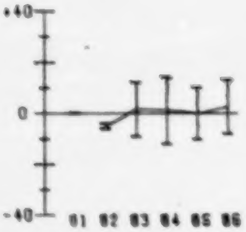
REG   : 08
STATE : 06 COLORADO
REPORG: 001 DEPARTMENT OF HEALTH

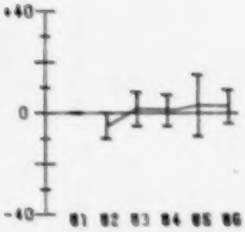
PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





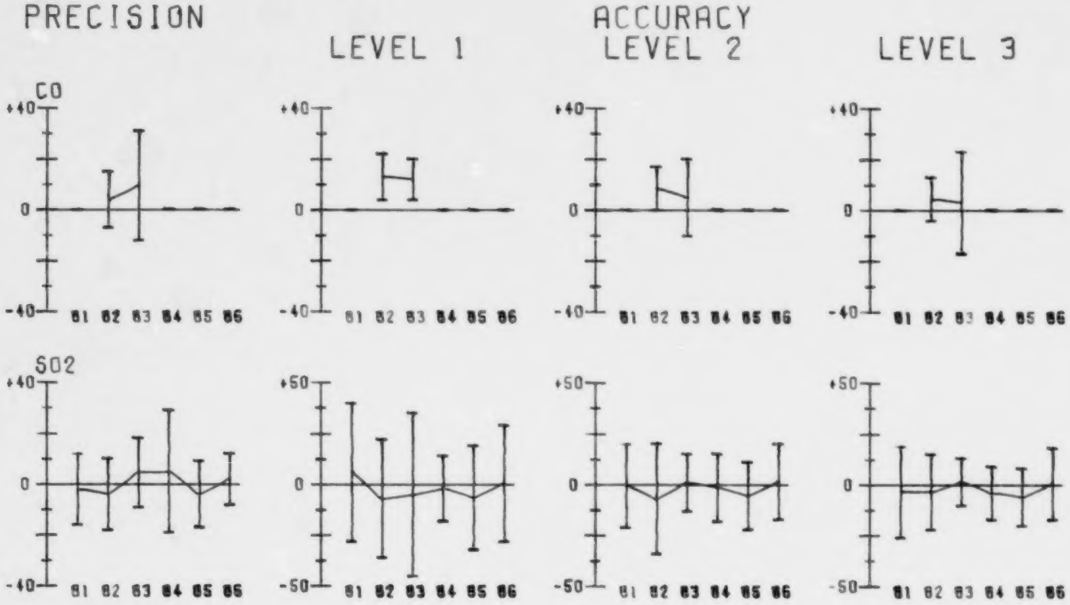






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 08
STATE : 27 MONTANA
REPORG: 001 MT AIR QUAL. BUREAU, DEPT. OF H&ENV.



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 08
STATE : 27   MONTANA
REPORG: 001 MT AIR QUAL. BUREAU. DEPT. OF H&ENV.

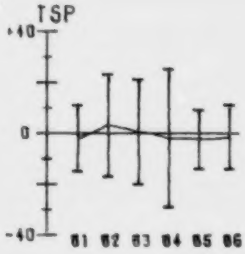
PRECISION

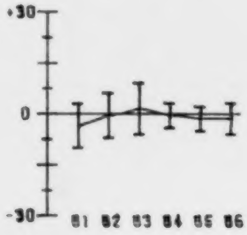
ACCURACY

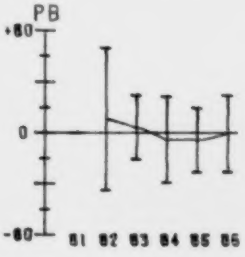
LEVEL 1

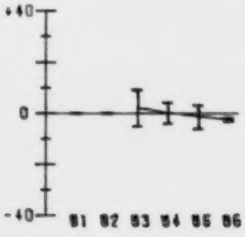
LEVEL 2

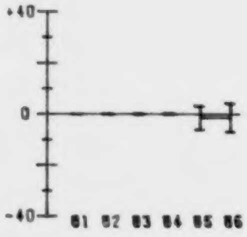
LEVEL 3







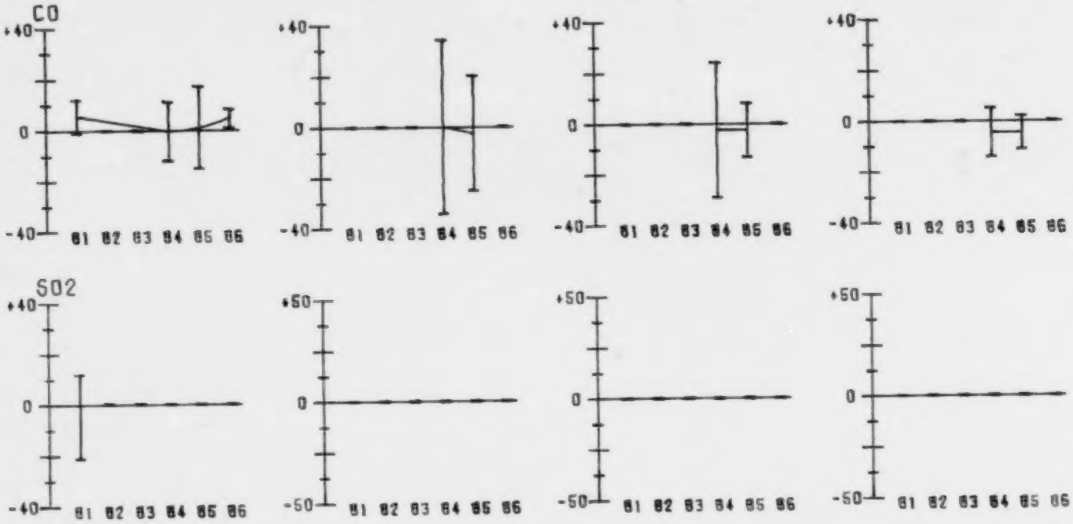




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 08
STATE : 27   MONTANA
REPORG: 002 YELLOWSTONE CNTY. AIR POLL. CONT. AGENCY

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3

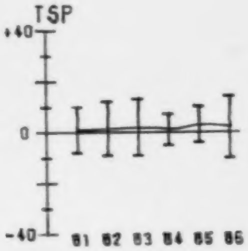


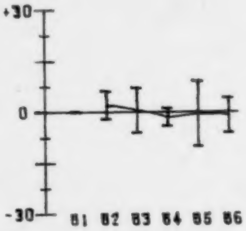
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 08
STATE : 27 MONTANA
REPORG: 002 YELLOWSTONE CNTY. AIR POLL. CONT. AGENCY

PRECISION

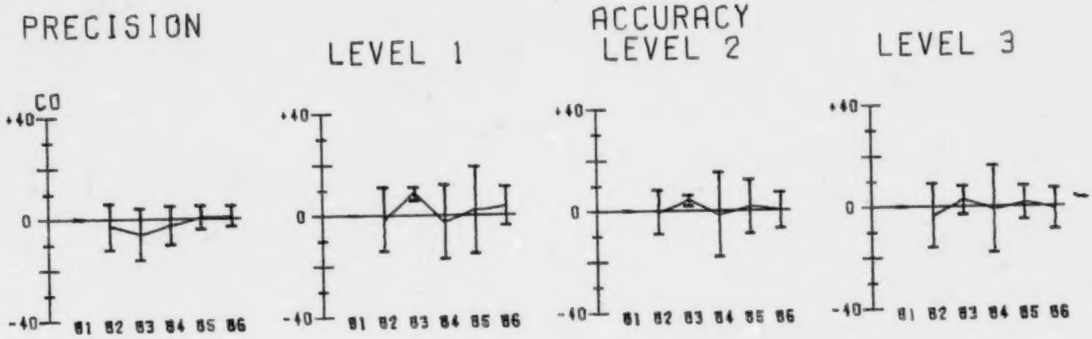
ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 08
STATE : 27 MONTANA
REPORG: 003 GREAT FALLS CITY-CNTY. HEALTH DEPT.



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

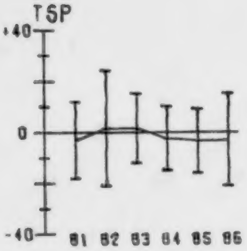
REG   : 08
STATE : 27   MONTANA
REPORG : 003 GREAT FALLS CITY-CNTY. HEALTH DEPT.

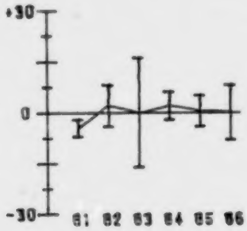
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

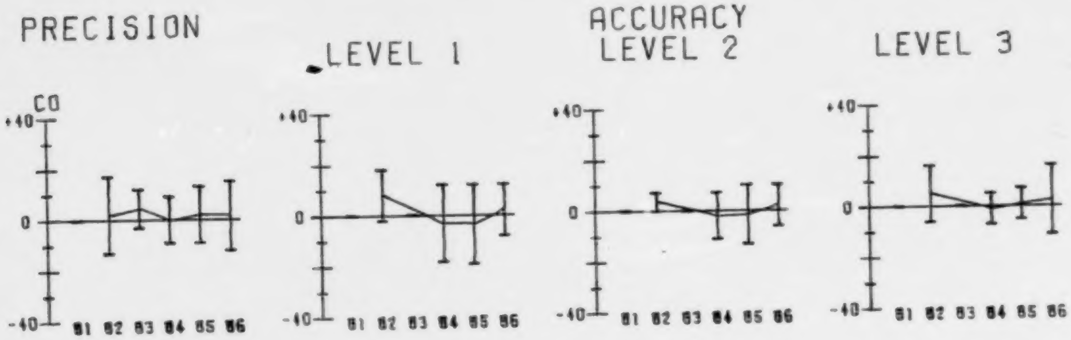
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 08
STATE : 27 MONTANA
REPORG: 004 MISSOULA CITY-CNTY HEALTH DEPT.



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 08
STATE : 27 MONTANA
REPORG: 004 MISSOULA CITY-CNTY HEALTH DEPT.

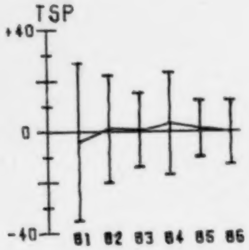
PRECISION

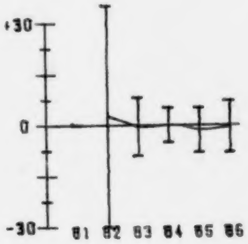
ACCURACY

LEVEL 1

LEVEL 2

LEVEL 3

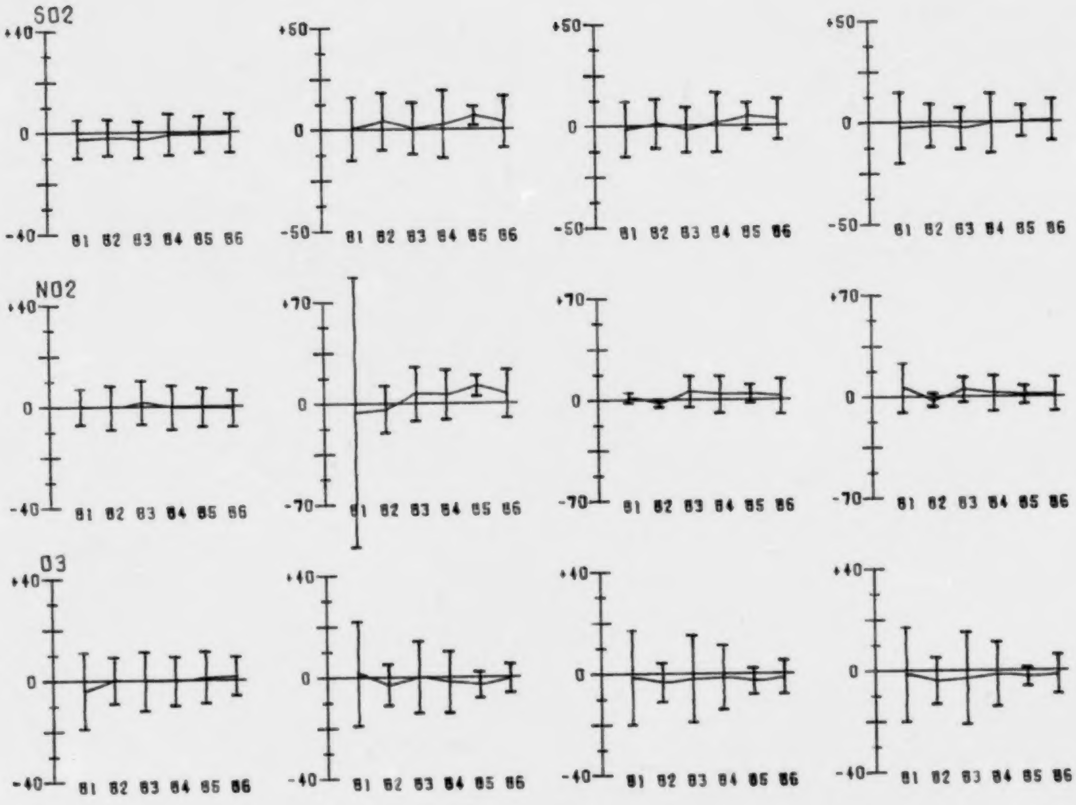




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 08
STATE : 35   NORTH DAKOTA
REPORG: 001 STATE DEPARTMENT OF HEALTH

PRECISION   ACCURACY
LEVEL 1   LEVEL 2   LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 08
STATE : 35   NORTH DAKOTA
REPORG: 001 STATE DEPARTMENT OF HEALTH

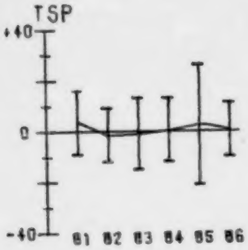
PRECISION

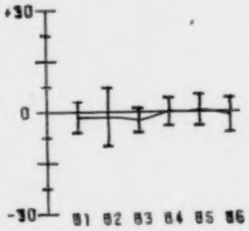
ACCURACY

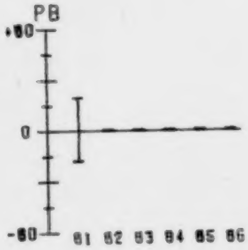
LEVEL 1

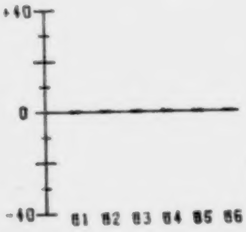
LEVEL 2

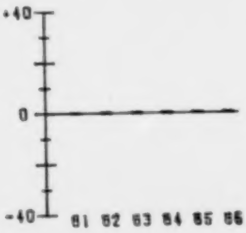
LEVEL 3











95% PROBABILITY LIMITS 81-86
MANUAL METHODS

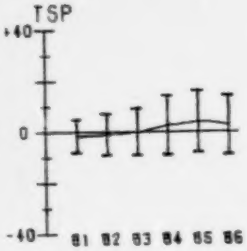
REG : 08
STATE : 43 SOUTH DAKOTA
REPORG: 001 DEPT. OF HEALTH, DIV. OF ENV. HEALTH

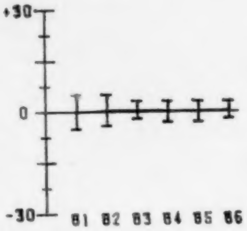
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

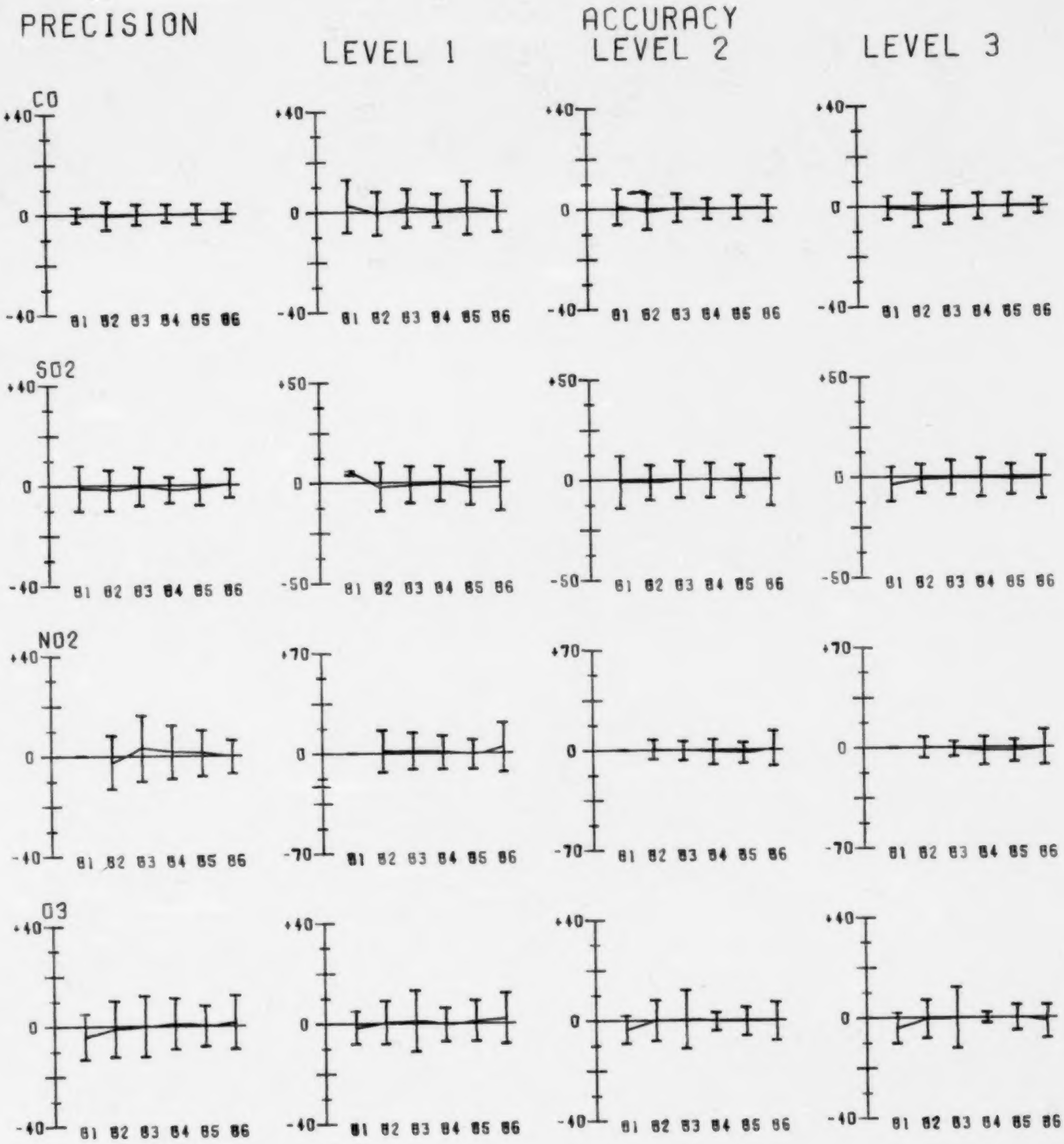
LEVEL 3





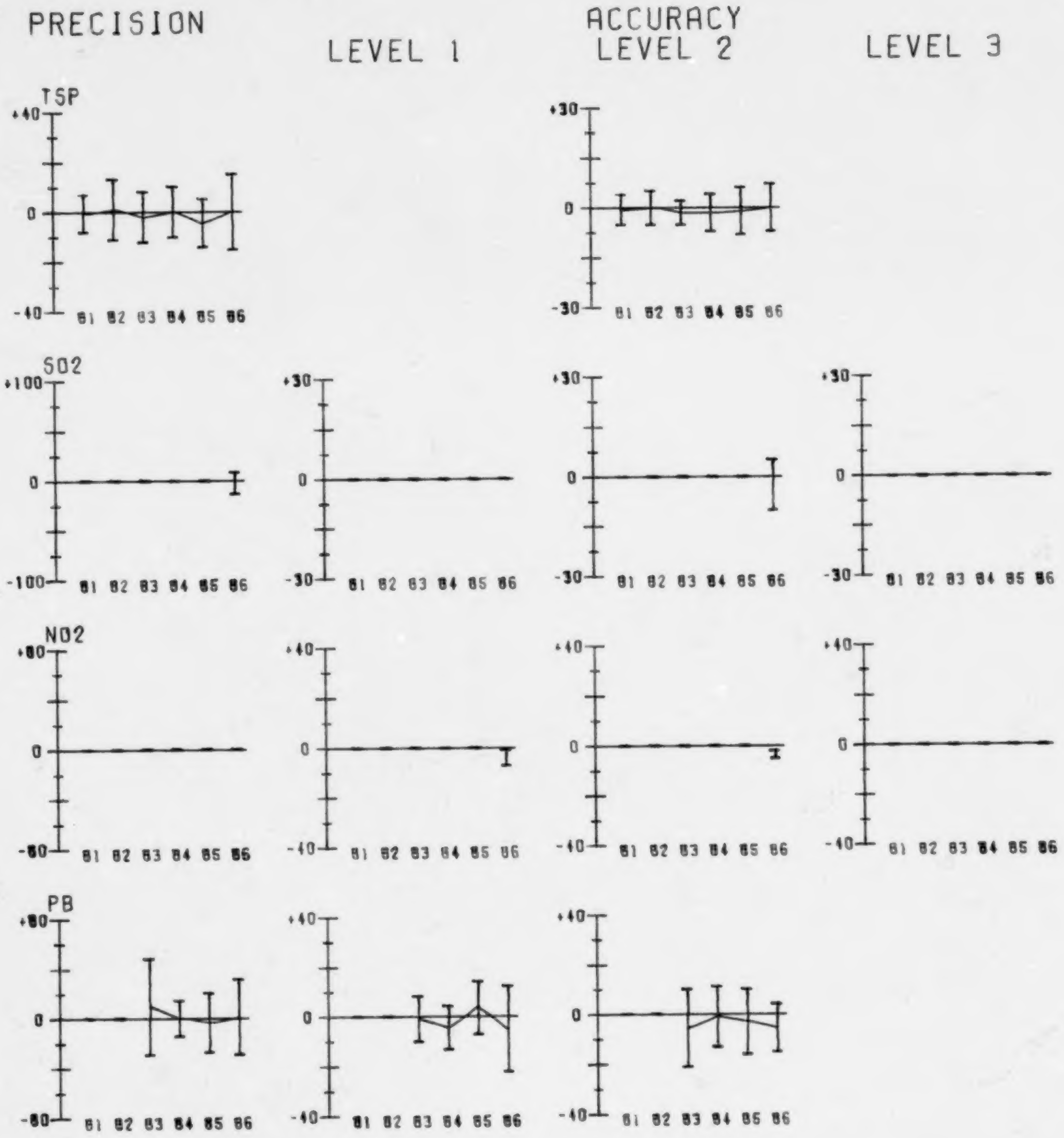
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 08
STATE : 46   UTAH
REPORG : 001 STATE BUREAU OF AIR QUALITY



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 08
STATE : 46   UTAH
REPORG: 001 STATE BUREAU OF AIR QUALITY



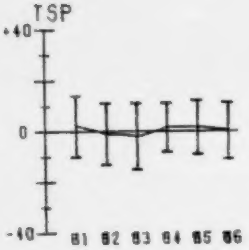
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

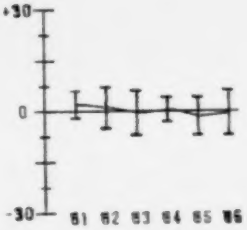
REG : 08
STATE : 52 WYOMING
REPORG: 001 DEPT. OF ENV. QUAL., AIR QUAL DIV

PRECISION

ACCURACY

LEVEL 1 LEVEL 2 LEVEL 3

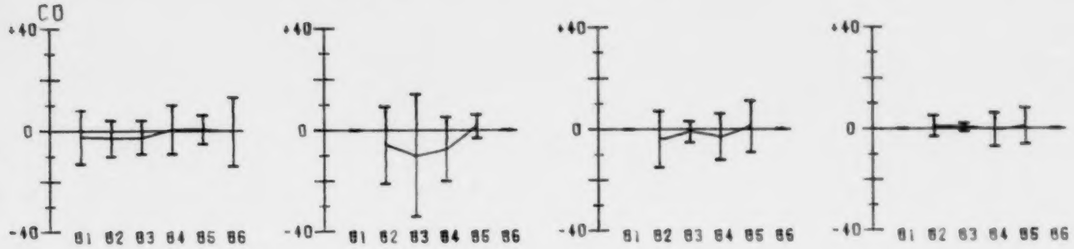


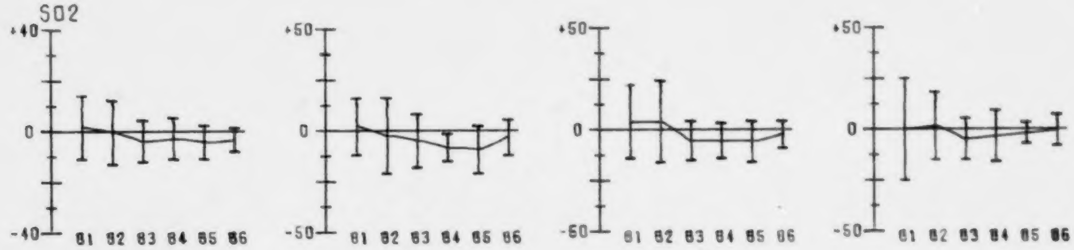


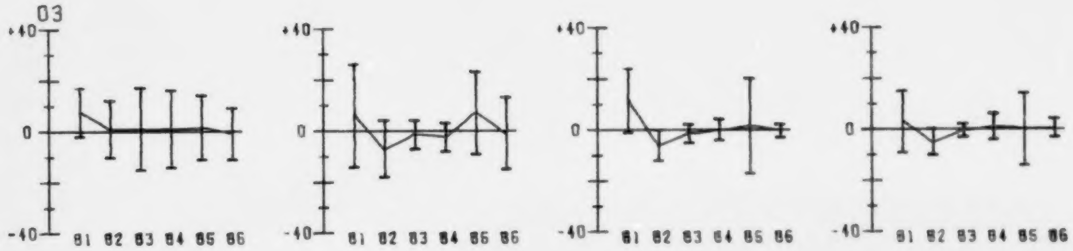
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 09
STATE : 03 ARIZONA
REPORG: 100 ARIZONA DEPT. OF HEALTH SERVICES

PRECISION | ACCURACY LEVEL 1 | LEVEL 2 | LEVEL 3



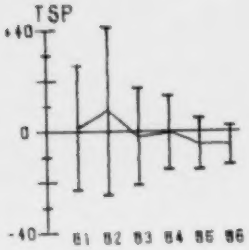


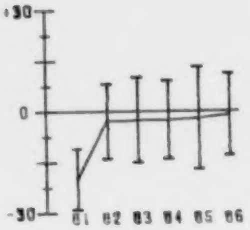


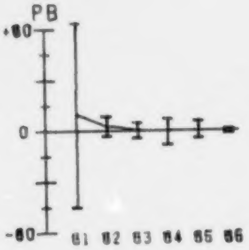
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

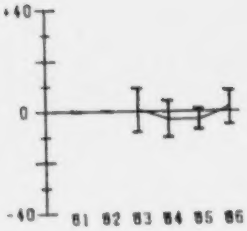
REG   : 09
STATE : 03 ARIZONA
REPORG : 100 ARIZONA DEPT. OF HEALTH SERVICES

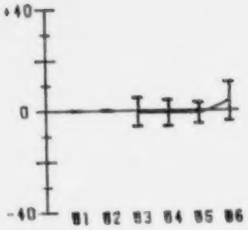
PRECISION   LEVEL 1   ACCURACY
LEVEL 2   LEVEL 3





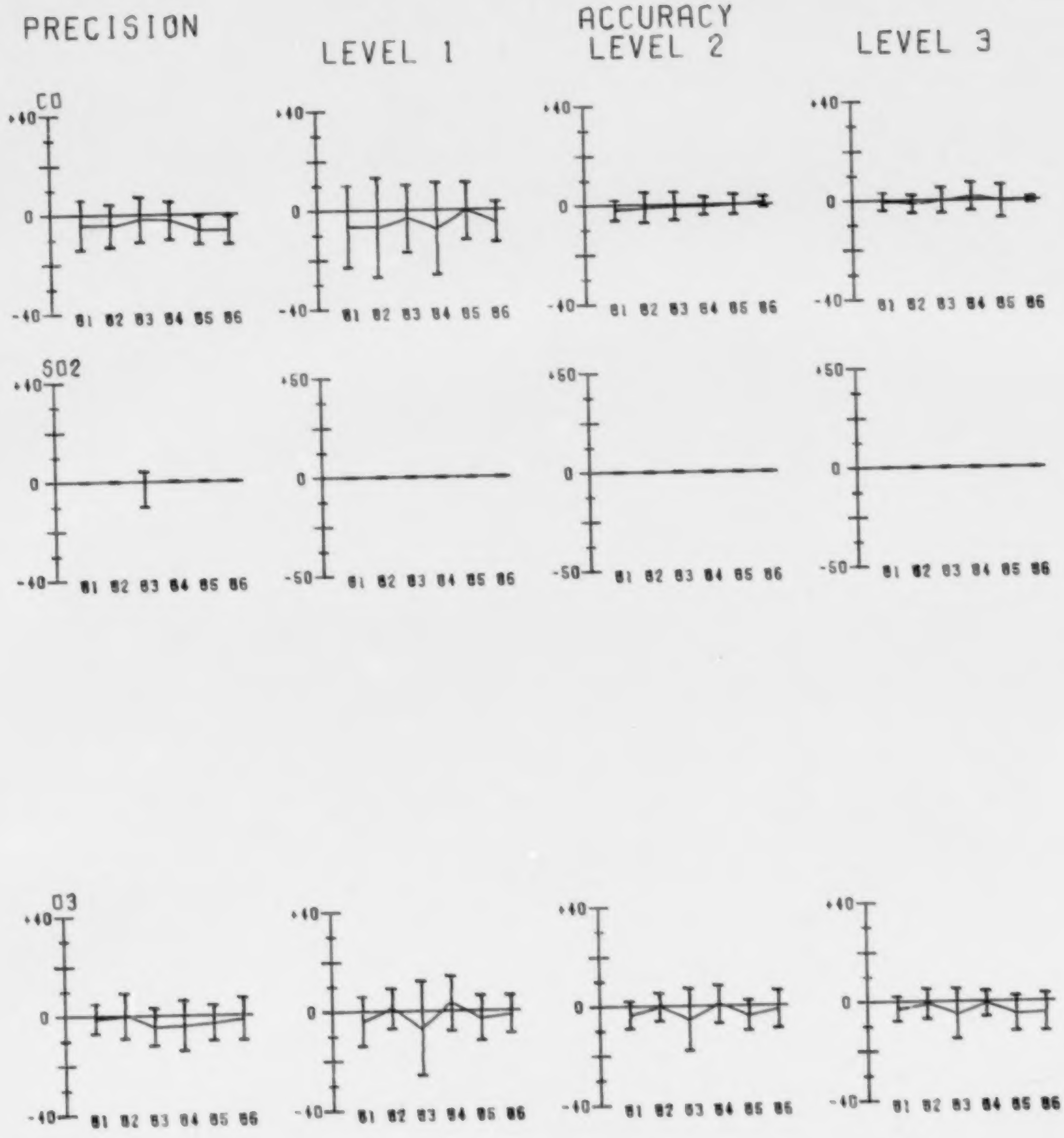






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 09
STATE : 03 ARIZONA
REPORG: 200 MARICOPA COUNTY



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

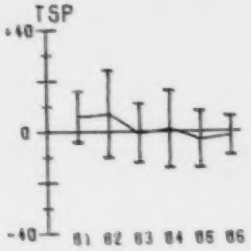
REG   : 09
STATE : 03 ARIZONA
REPORG: 200 MARICOPA COUNTY

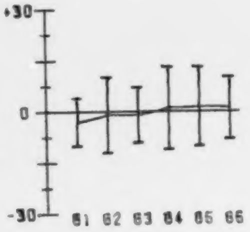
PRECISION

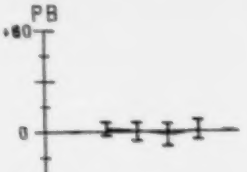
LEVEL 1

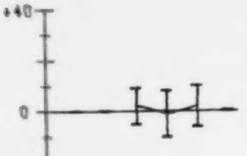
ACCURACY
LEVEL 2

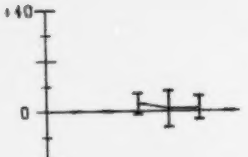
LEVEL 3





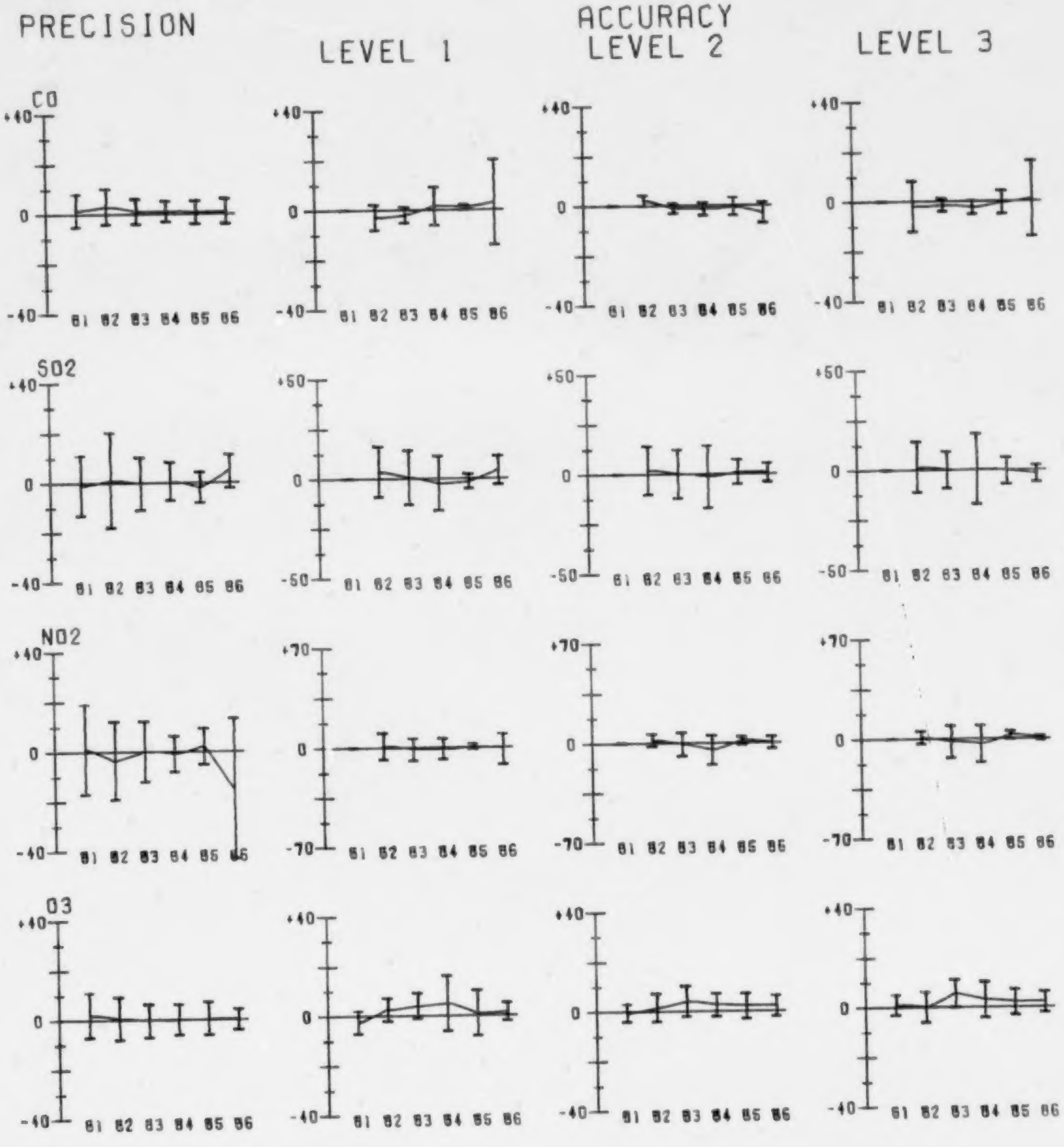






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

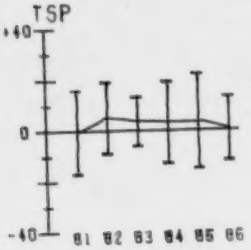
REG : 09
STATE : 03 ARIZONA
REPORG: 300 PIMA COUNTY

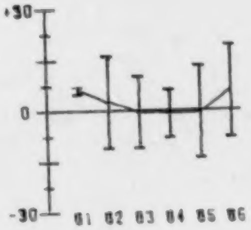


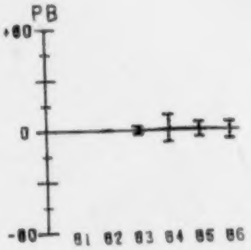
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

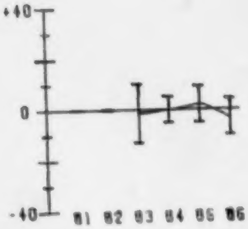
REG : 09
STATE : 03 ARIZONA
REPORG: 300 PIMA COUNTY

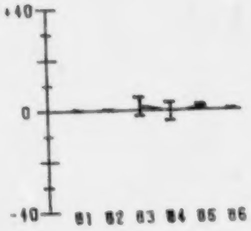
PRECISION LEVEL 1 ACCURACY LEVEL 2 LEVEL 3





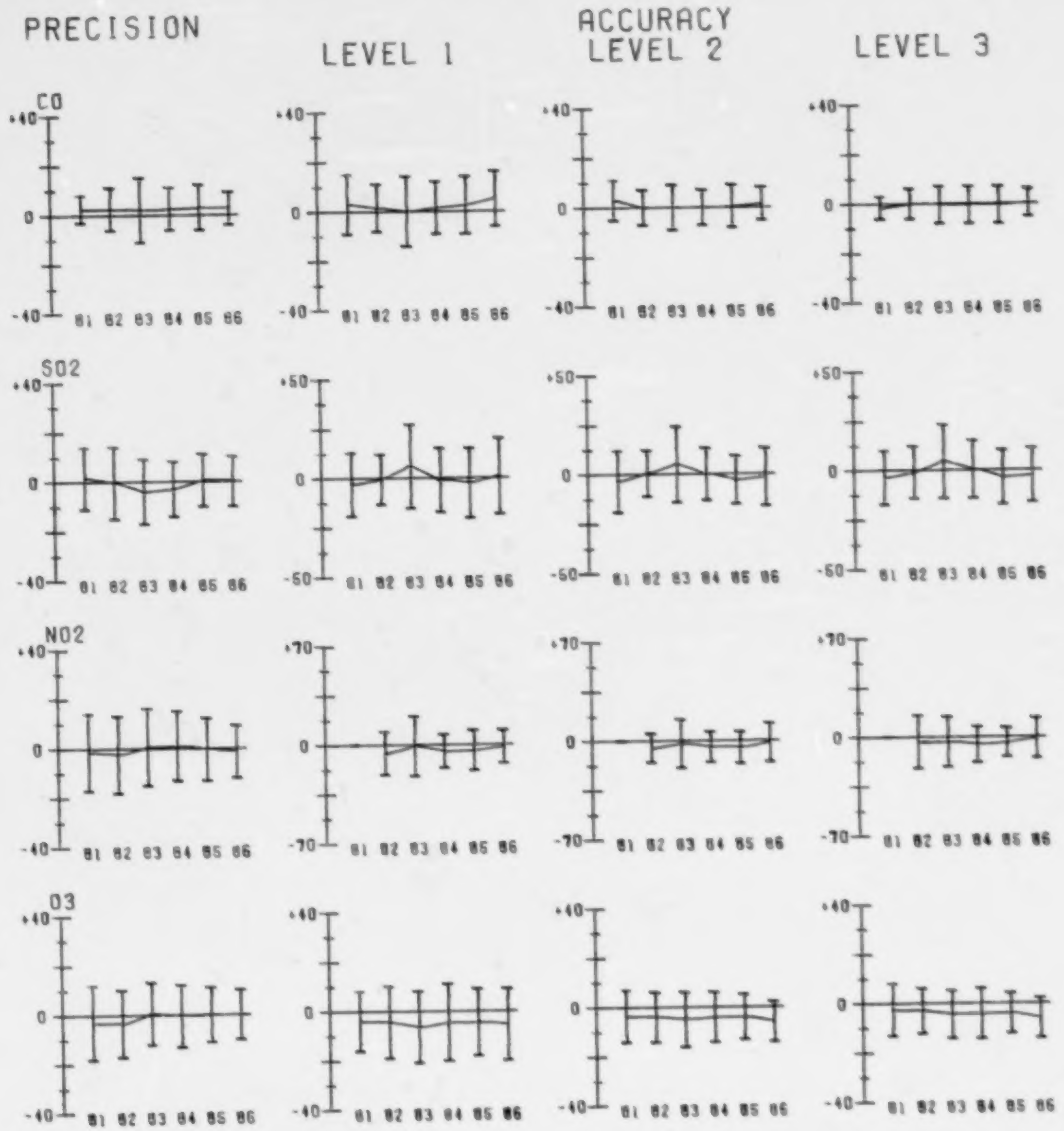






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

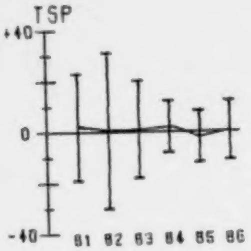
REG   : 09
STATE : 05 CALIFORNIA
REPORG: 001 CALIFORNIA AIR RESOURCES BOARD

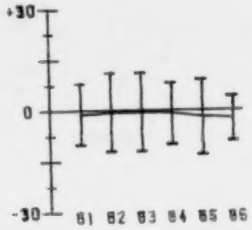


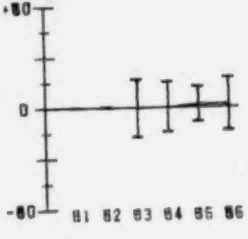
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

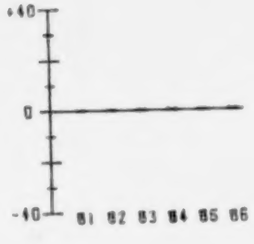
REG   : 09
STATE : 05 CALIFORNIA
REPORG : 001 CALIFORNIA AIR RESOURCES BOARD

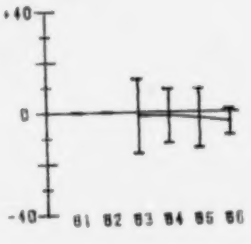
PRECISION   LEVEL 1   ACCURACY
                                    LEVEL 2   LEVEL 3





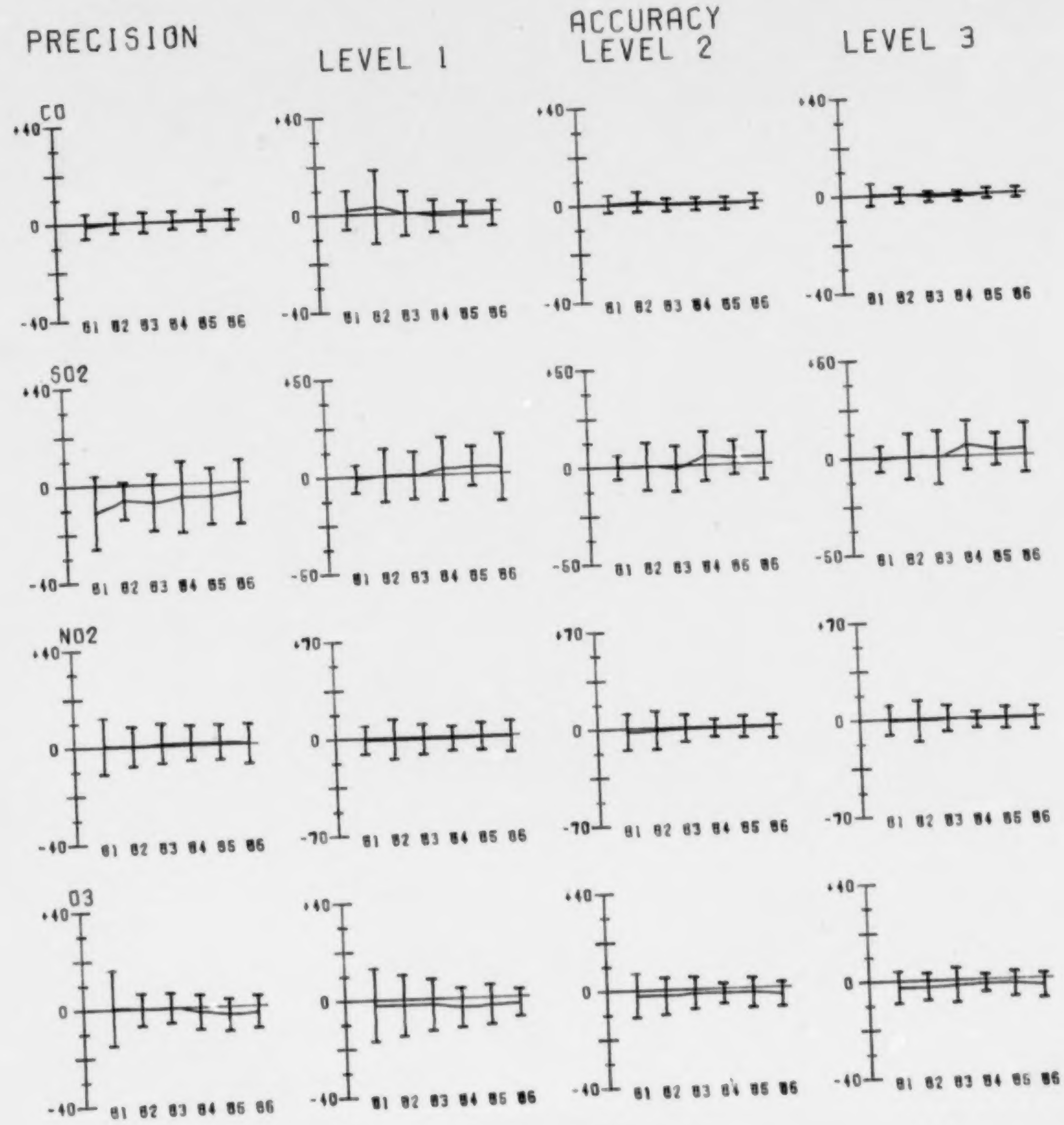






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

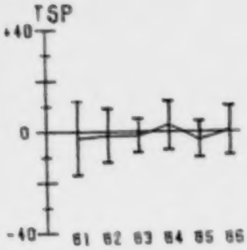
REG   : 09
STATE : 05 CALIFORNIA
REPORG: 004 BAY AREA AIR QUAL. MANAGEMENT DISTRICT

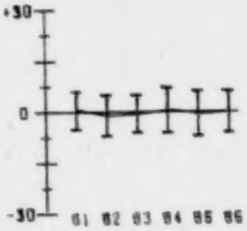


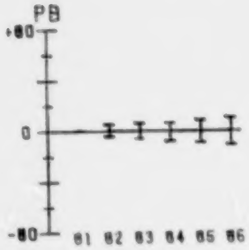
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

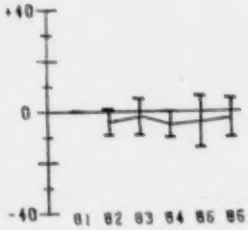
REG   : 09
STATE : 05 CALIFORNIA
REPORG: 004 BAY AREA AIR QUAL. MANAGEMENT DISTRICT

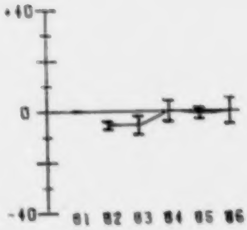
PRECISION | LEVEL 1 | ACCURACY LEVEL 2 | LEVEL 3







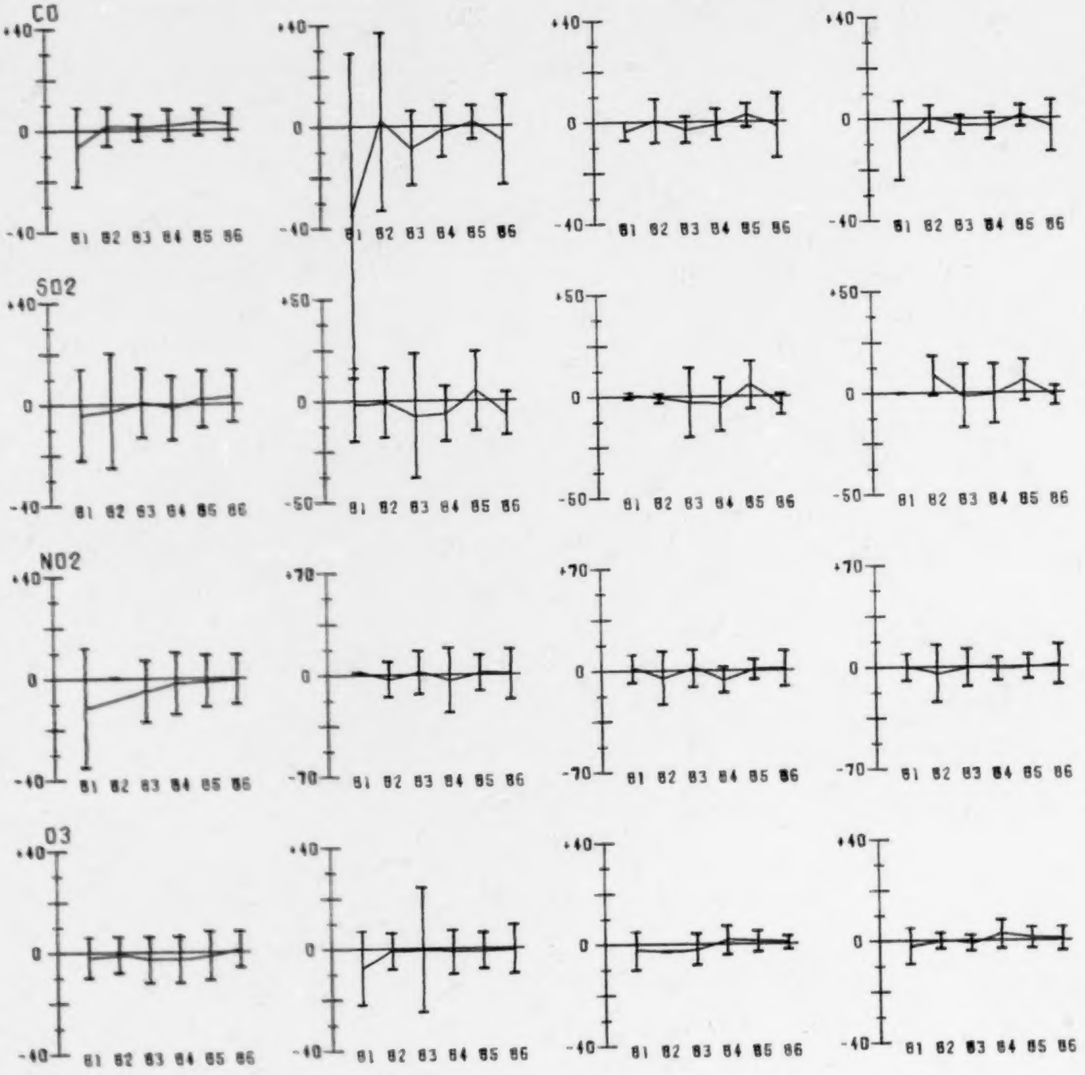




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 09
STATE : 05 CALIFORNIA
REPORG: 036 SAN DIEGO AIR POLL. CONTROL DISTRICT

PRECISION — ACCURACY: LEVEL 1, LEVEL 2, LEVEL 3



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 09
STATE : 05 CALIFORNIA
REPORG : 036 SAN DIEGO AIR POLL. CONTROL DISTRICT

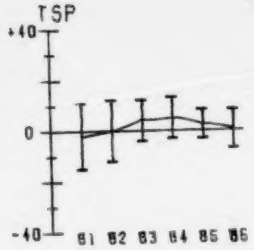
PRECISION

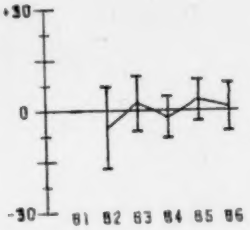
ACCURACY

LEVEL 1

LEVEL 2

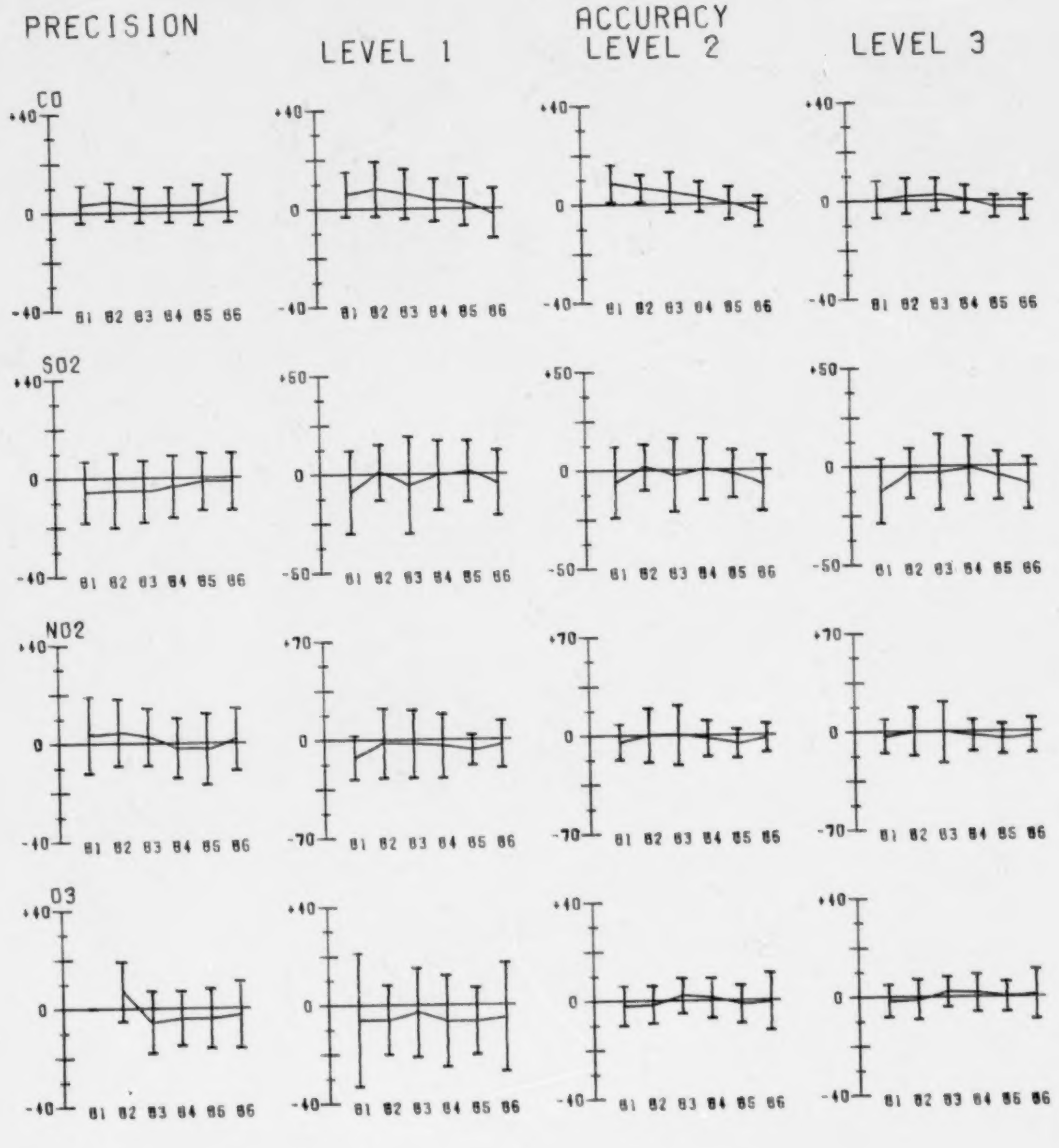
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 09
STATE : 05 CALIFORNIA
REPORG: 061 SOUTH COAST AIR QUAL. MANAGEMENT DIST.

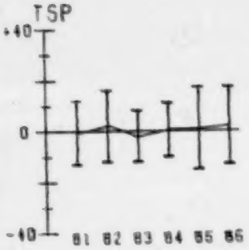


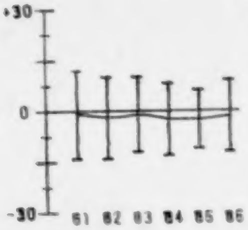
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

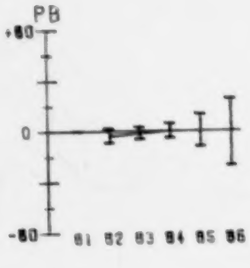
REG   : 09
STATE : 05   CALIFORNIA
REPORG : 061 SOUTH COAST AIR QUAL. MANAGEMENT DIST.

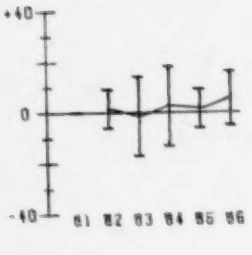
PRECISION

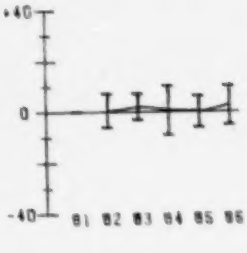
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3





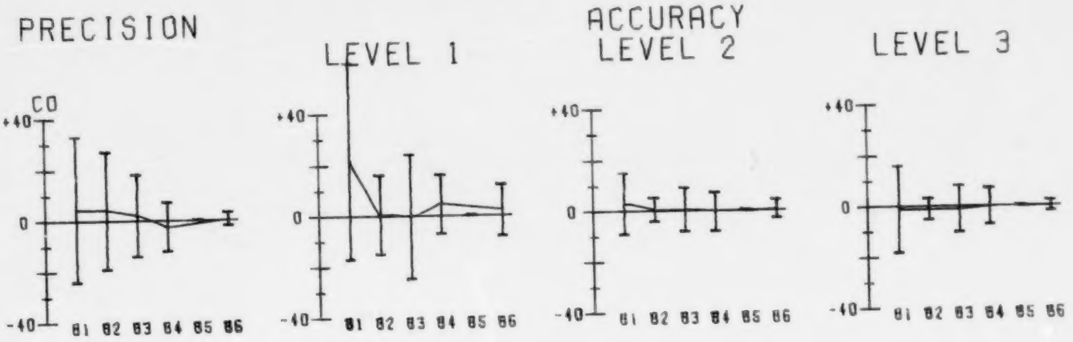


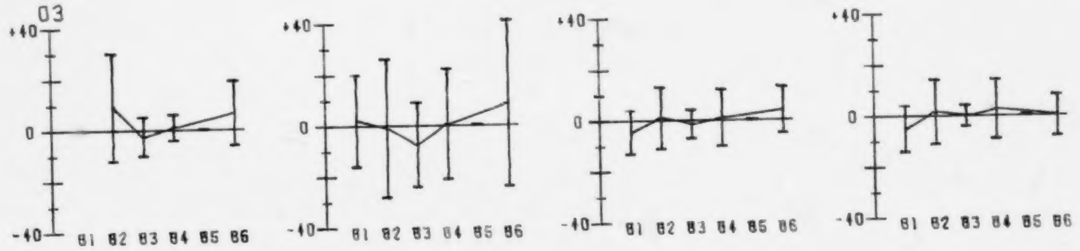




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 09
STATE : 12 HAWAII
REPORG: 120 STATE OF HAWAII, DEPT. OF HEALTH

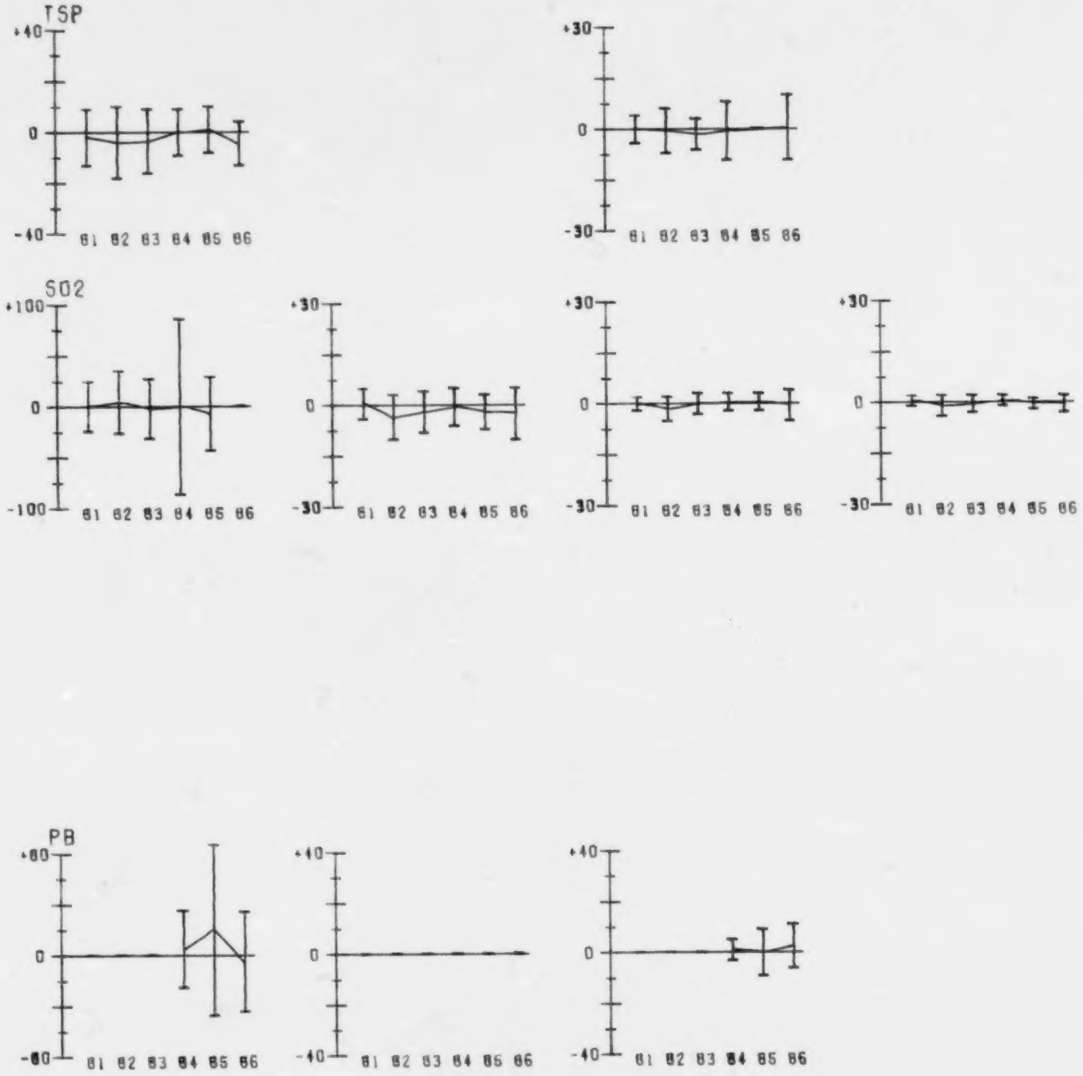




95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 09
STATE : 12 HAWAII
REPORG: 120 STATE OF HAWAII, DEPT. OF HEALTH

PRECISION ACCURACY
LEVEL 1 LEVEL 2 LEVEL 3



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

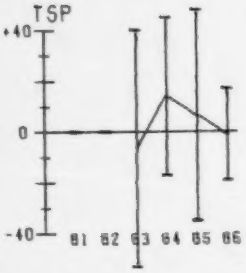
REG   : 09
STATE : 29 NEVADA
REPORG: 100 NEVADA DIV. OF ENV. PROTECTION

PRECISION	ACCURACY LEVEL 1	LEVEL 2	LEVEL 3

95% PROBABILITY LIMITS 81-86
MANUAL METHODS

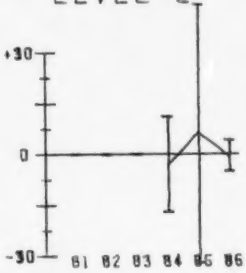
REG : 09
STATE : 29 NEVADA
REPORG: 100 NEVADA DIV. OF ENV. PROTECTION

PRECISION



LEVEL 1

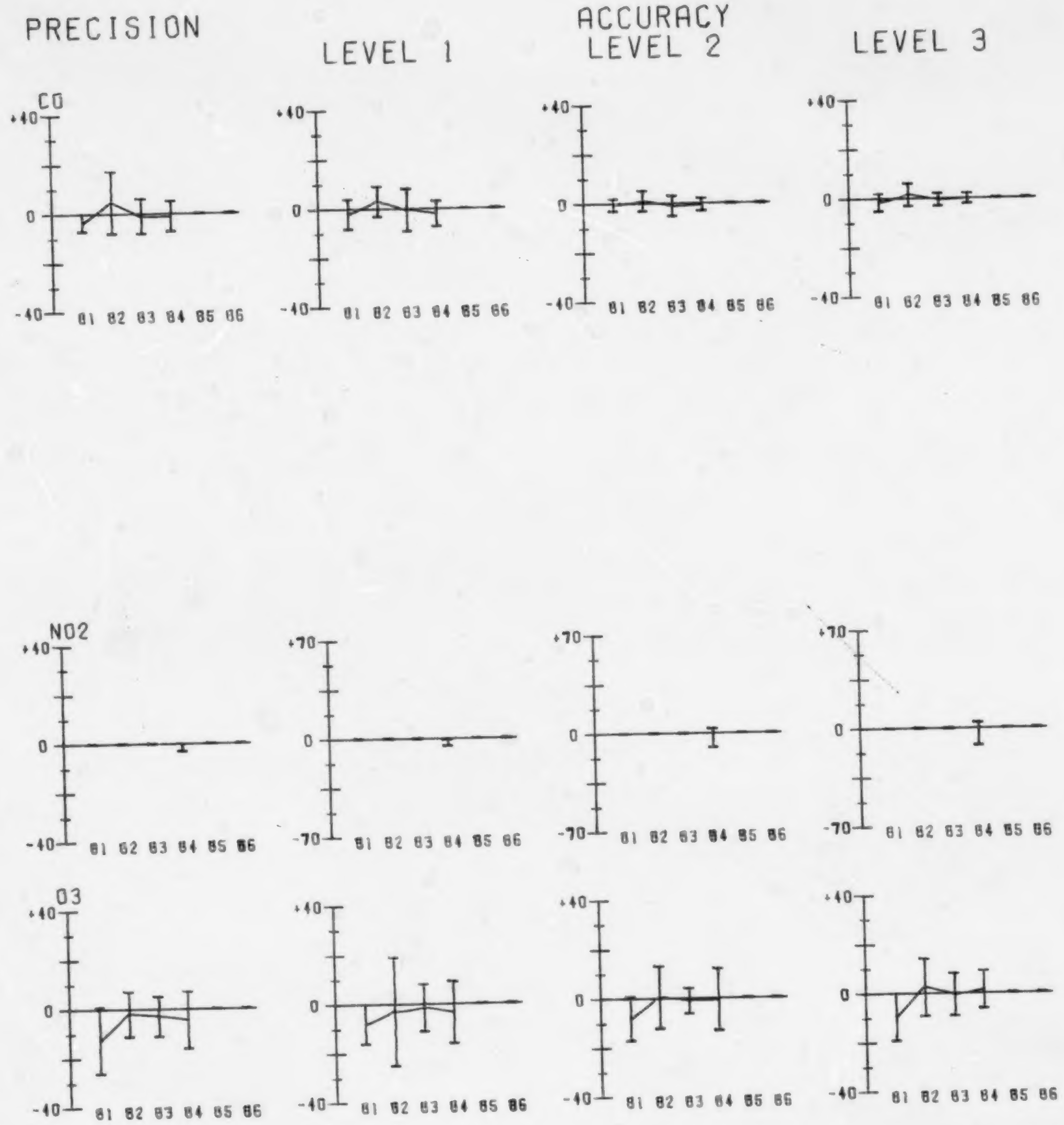
ACCURACY
LEVEL 2



LEVEL 3

95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 09
STATE : 29 NEVADA
REPORG: 200 WASHOE COUNTY



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

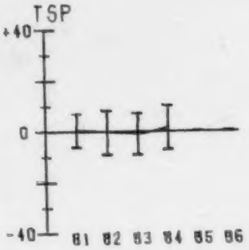
REG : 09
STATE : 29 NEVADA
REPORG: 200 WASHOE COUNTY

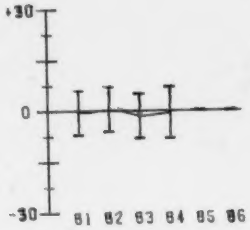
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

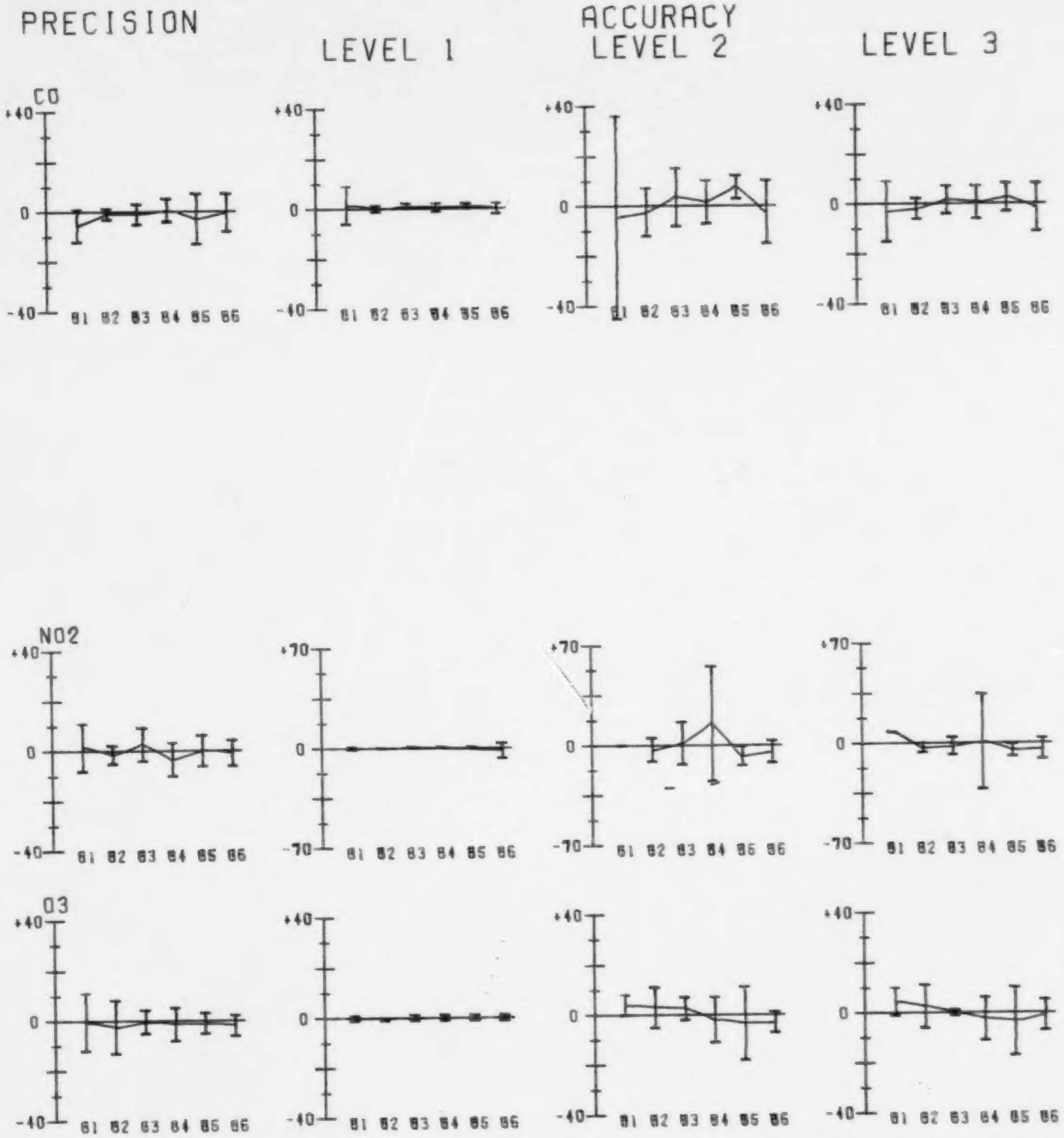
LEVEL 3





95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 09
STATE : 29 NEVADA
REPORG: 300 CLARK COUNTY



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

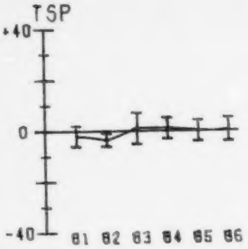
REG   : 09
STATE : 29 NEVADA
REPORG : 300 CLARK COUNTY

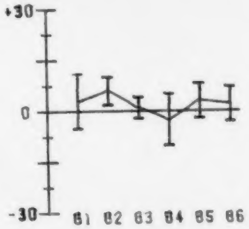
PRECISION

LEVEL 1

ACCURACY
LEVEL 2

LEVEL 3





```
                 95% PROBABILITY LIMITS 81-86
                      CONTINUOUS METHODS
REG    : 09
STATE  : 54  GUAM
REPORG : 100 GUAM EPA

 PRECISION                             ACCURACY
                    LEVEL 1            LEVEL 2            LEVEL 3
```

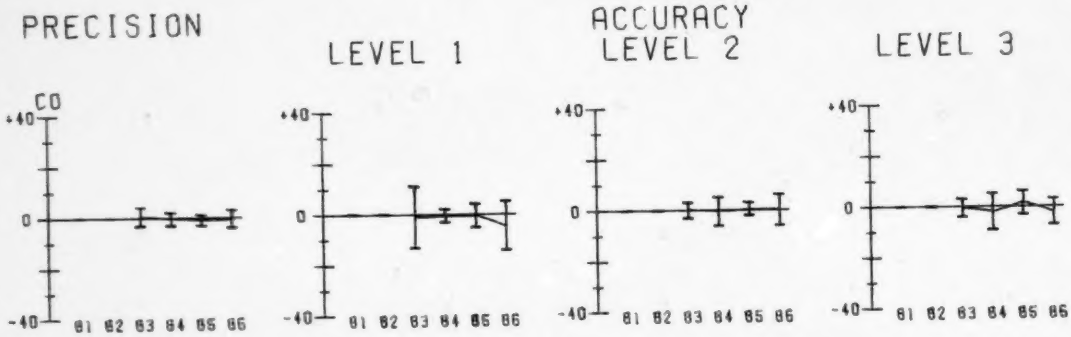
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG   : 09
STATE : 54 GUAM
REPORG : 100 GUAM EPA

PRECISION	ACCURACY LEVEL 1	LEVEL 2	LEVEL 3

95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 10
STATE : 02 ALASKA
REPORG: 020 DEPT. OF ENVIRONMENTAL CONSERVATION



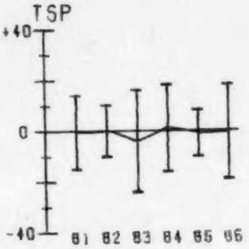
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

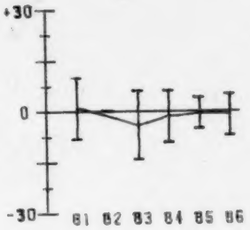
REG : 10
STATE : 02 ALASKA
REPORG: 020 DEPT. OF ENVIRONMENTAL CONSERVATION

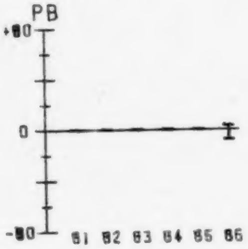
PRECISION

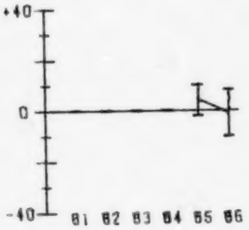
ACCURACY

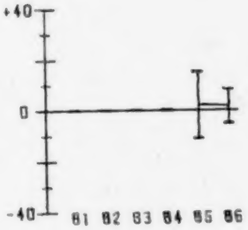
LEVEL 1 LEVEL 2 LEVEL 3





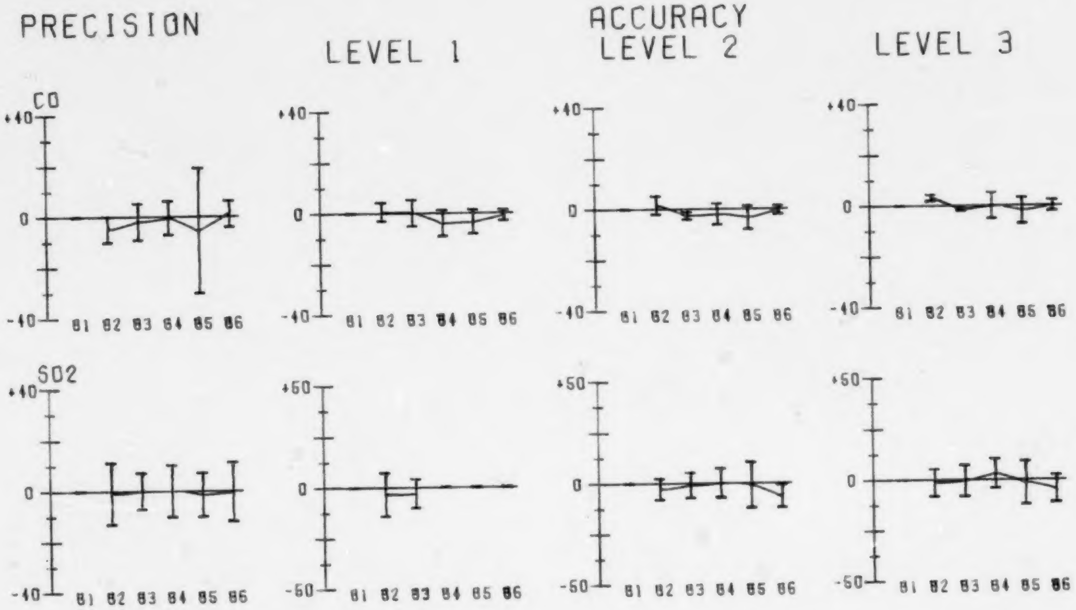






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 10
STATE : 13 IDAHO
REPORG: 001 DEPARTMENT OF HEALTH AND WELFARE



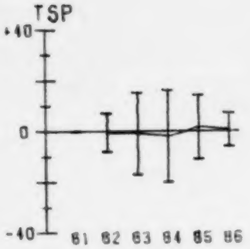
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

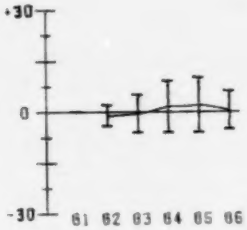
REG   : 10
STATE : 13 IDAHO
REPORG: 001 DEPARTMENT OF HEALTH AND WELFARE

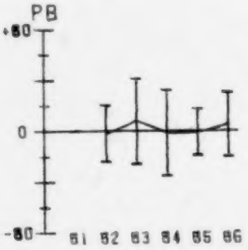
PRECISION

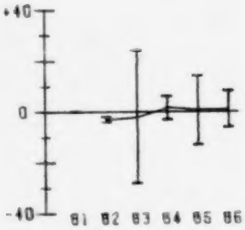
ACCURACY

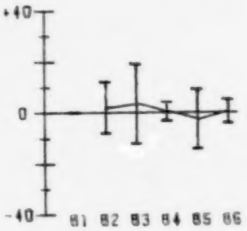
LEVEL 1   LEVEL 2   LEVEL 3





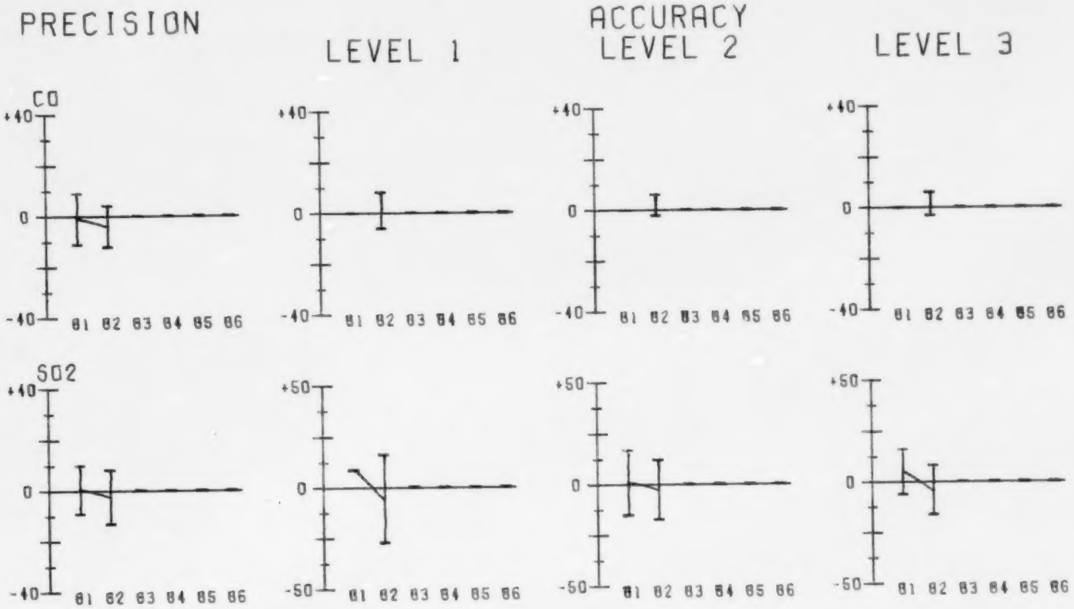






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

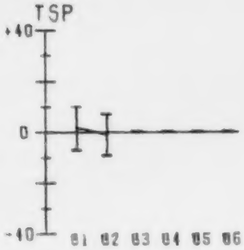
REG : 10
STATE : 13 IDAHO
REPORG: 002 ENGINEERING SCI INC-CONTRACTOR-DISC 1982

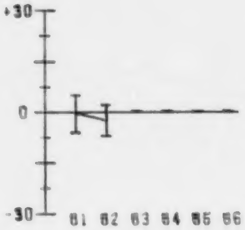


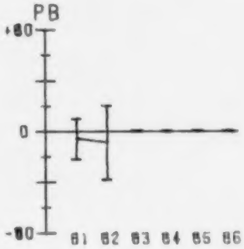
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

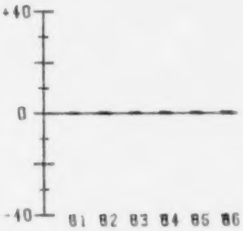
REG   : 10
STATE : 13 IDAHO
REPORG: 002 ENGINEERING SCI INC-CONTRACTOR-DISC 1982

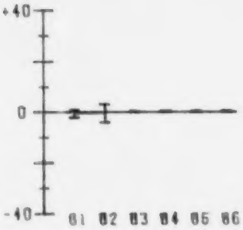
PRECISION | ACCURACY
LEVEL 1 | LEVEL 2 | LEVEL 3







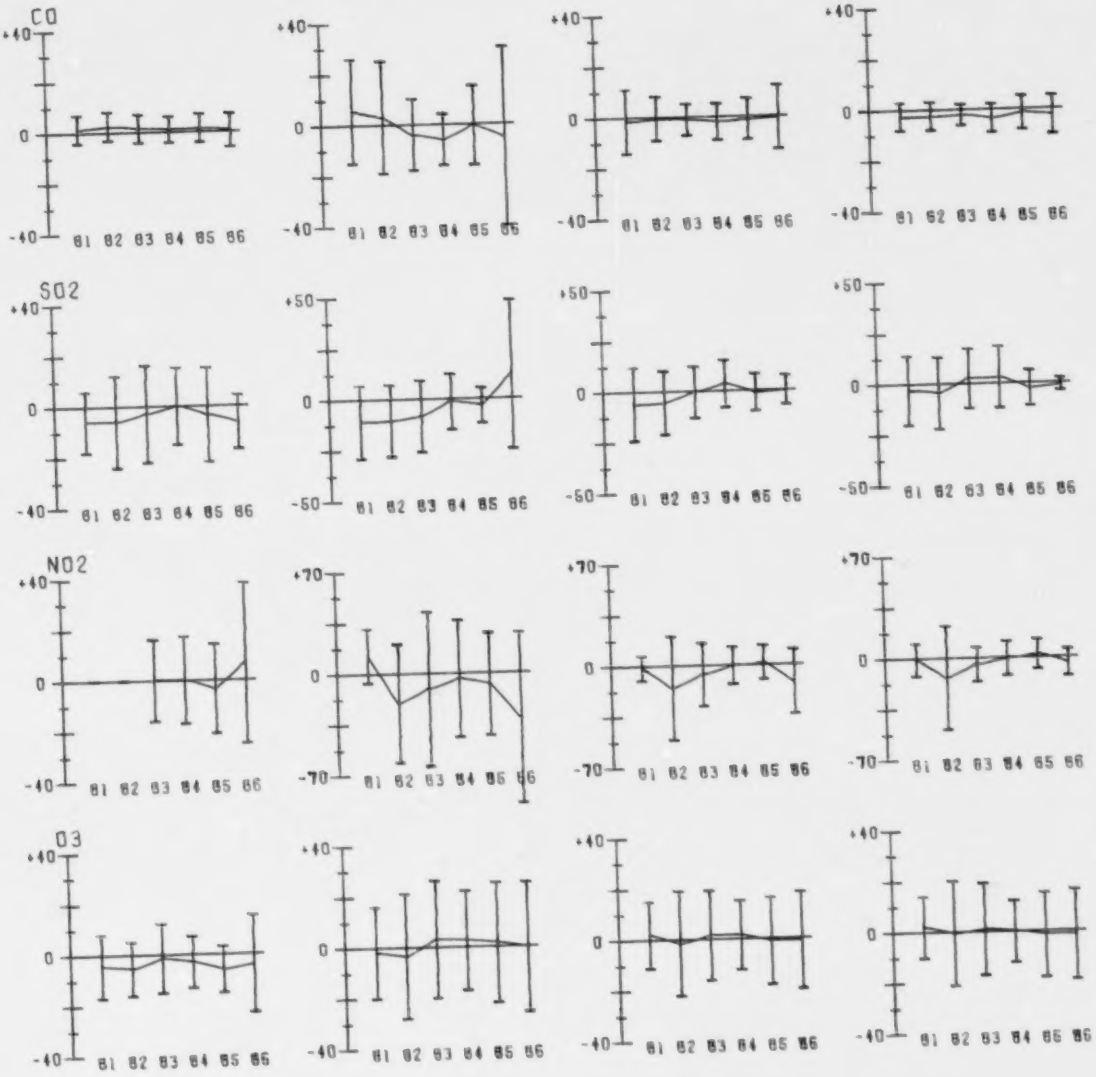




95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG   : 10
STATE : 38 OREGON
REPORG: 001 DEPT. OF ENVIRONMENTAL QUALITY

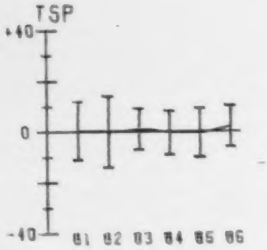
PRECISION
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3

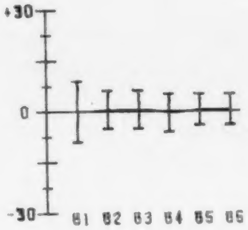


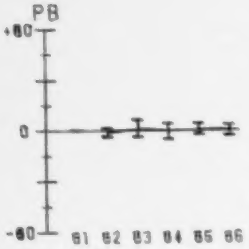
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

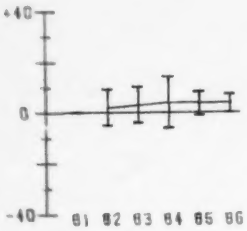
REG : 10
STATE : 38 OREGON
REPORG: 001 DEPT. OF ENVIRONMENTAL QUALITY

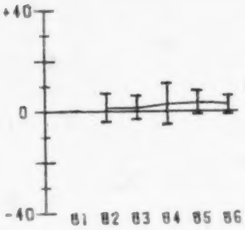
PRECISION
ACCURACY
LEVEL 1
LEVEL 2
LEVEL 3





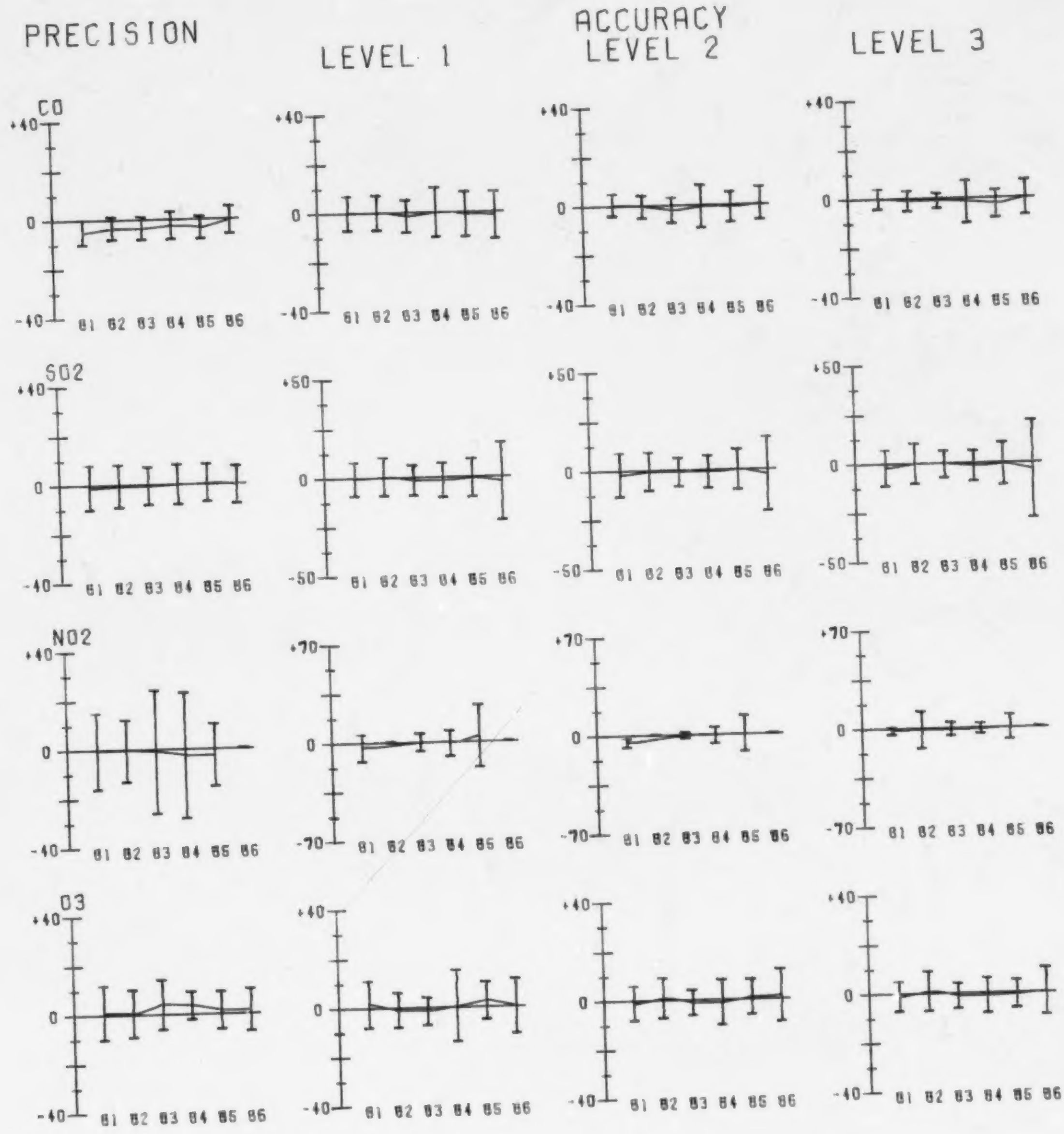






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 10
STATE : 49 WASHINGTON
REPORG: 001 DEPT. OF ECOLOGY



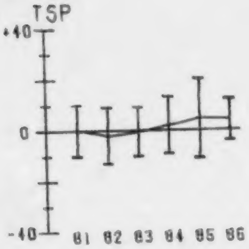
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

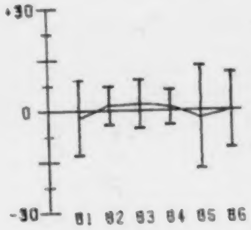
REG : 10
STATE : 49 WASHINGTON
REPORG: 001 DEPT. OF ECOLOGY

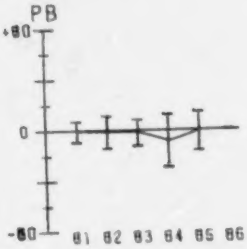
PRECISION

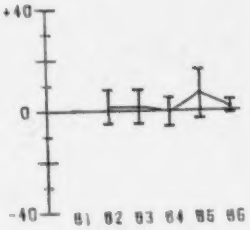
ACCURACY

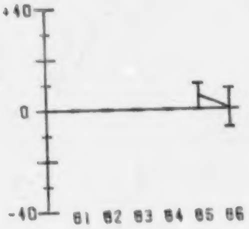
LEVEL 1 LEVEL 2 LEVEL 3









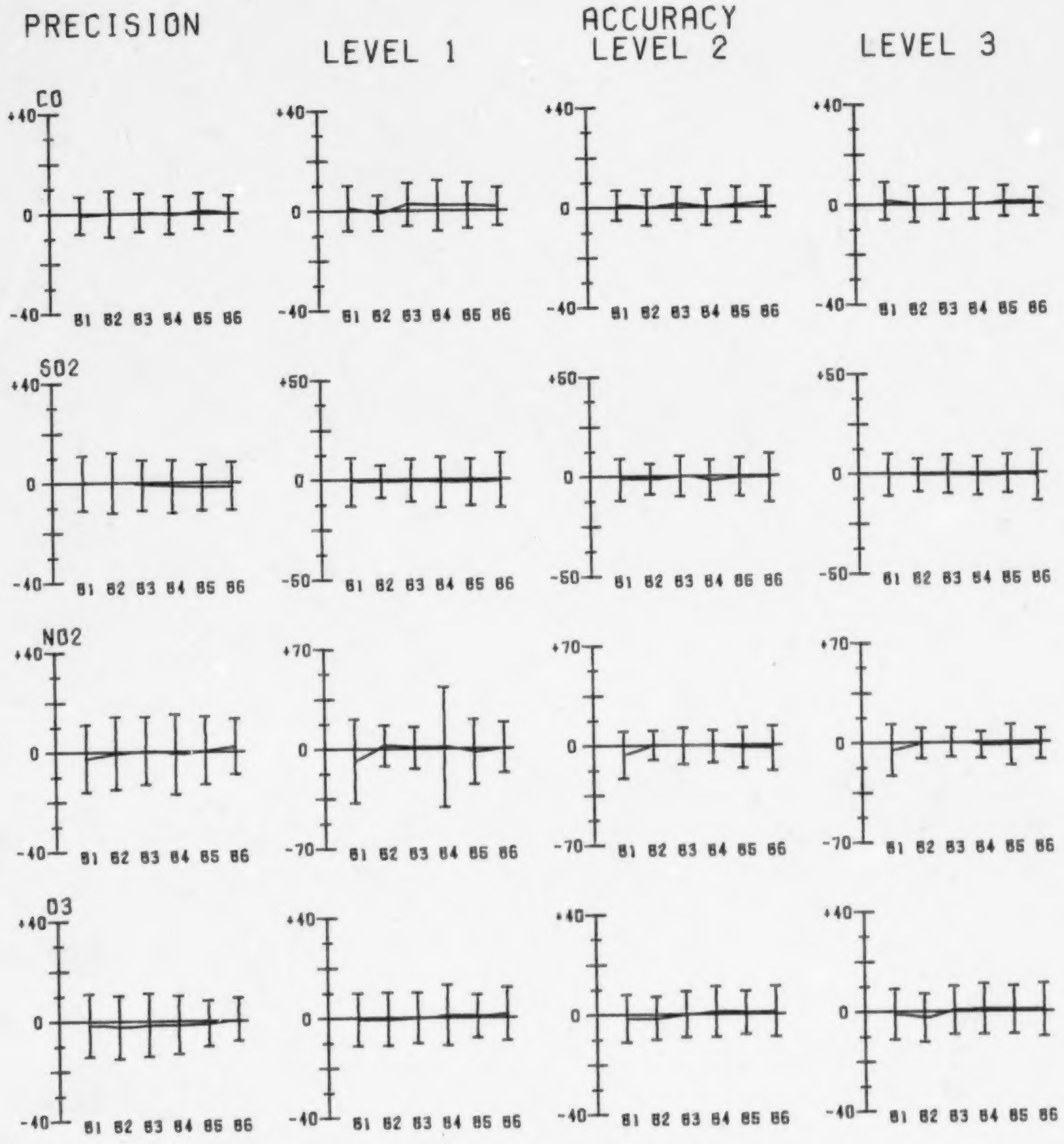


APPENDIX H

PRECISION AND ACCURACY GRAPHS FOR EACH EPA REGION

95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

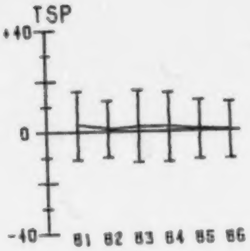
REG : 01

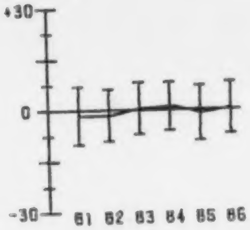


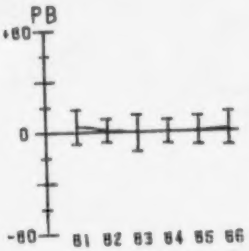
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

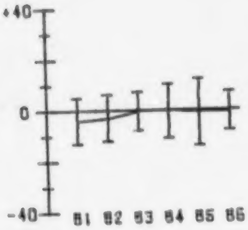
REG : 01

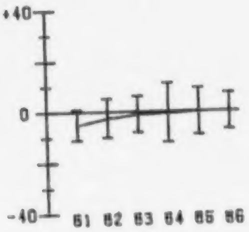
PRECISION LEVEL 1 ACCURACY LEVEL 2 LEVEL 3





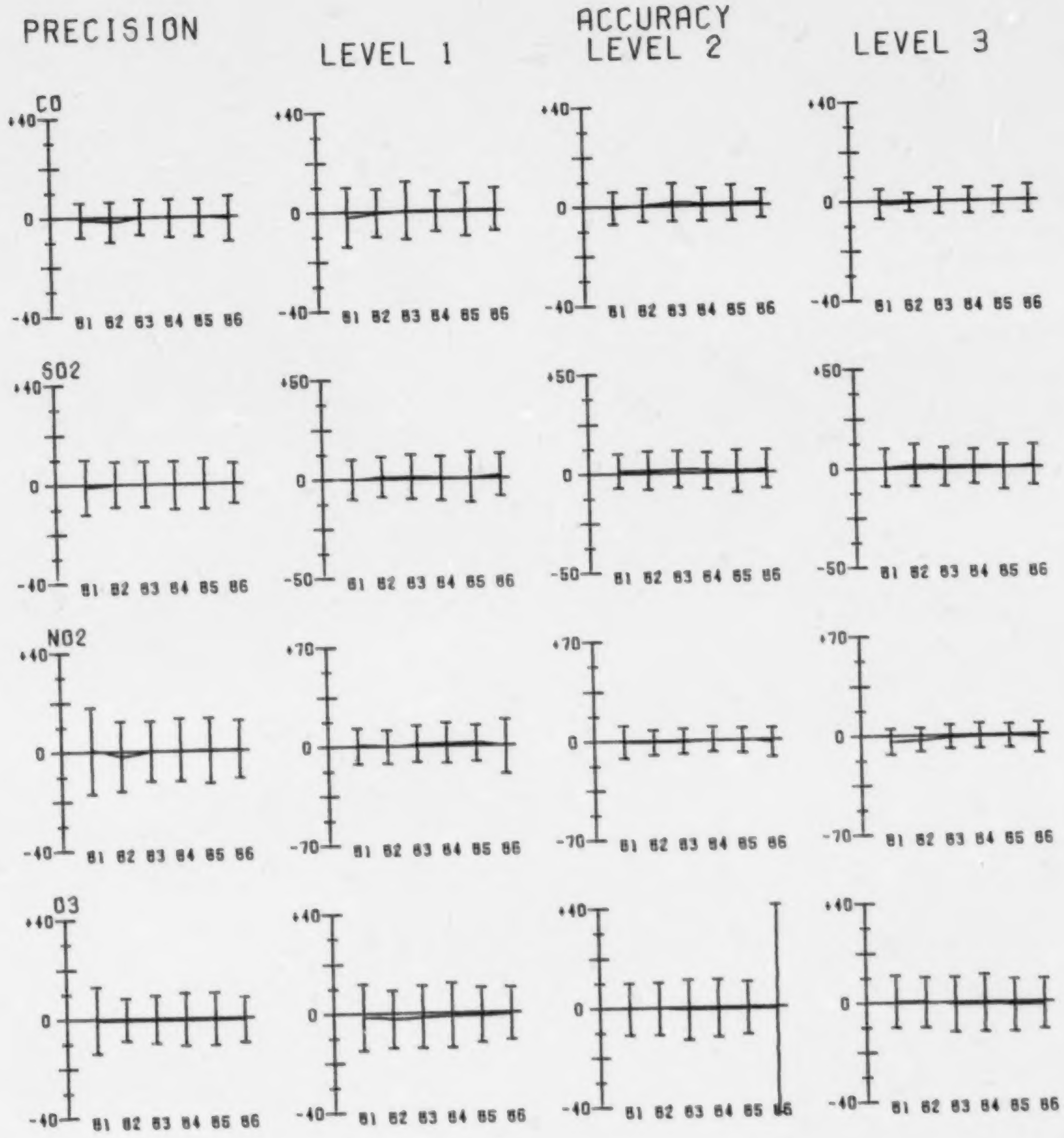






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 02



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

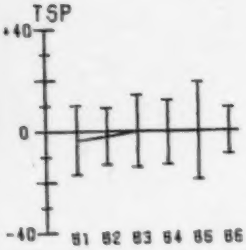
REG : 02

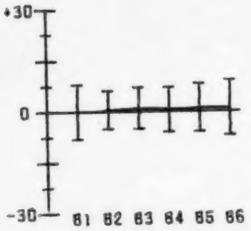
PRECISION

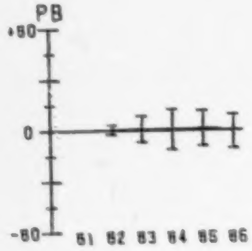
LEVEL 1

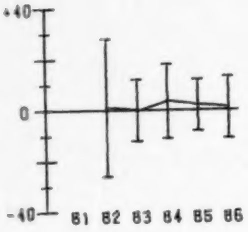
ACCURACY
LEVEL 2

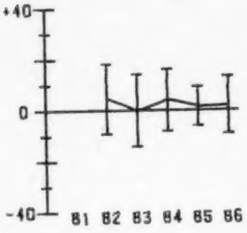
LEVEL 3





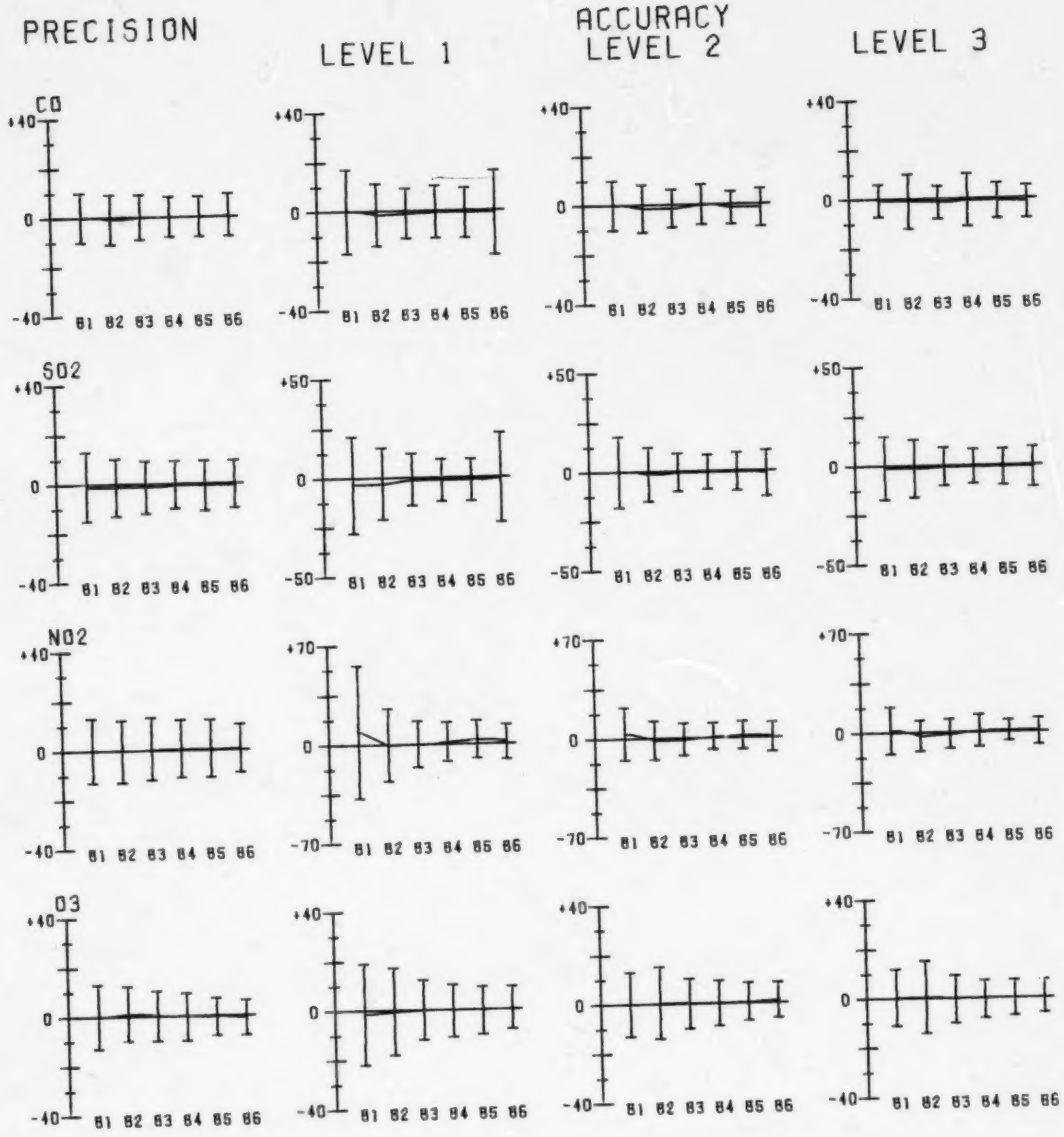






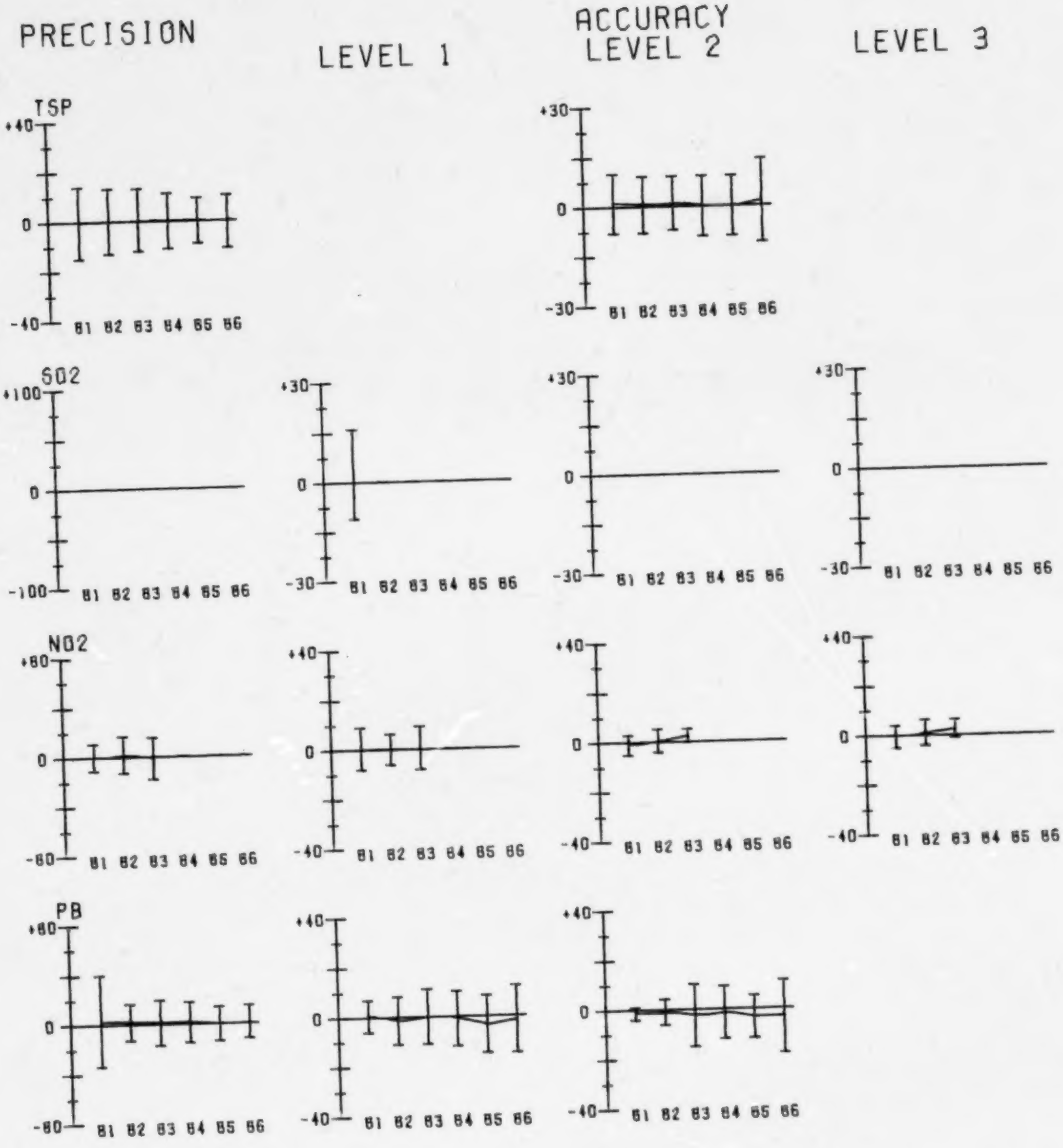
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 03



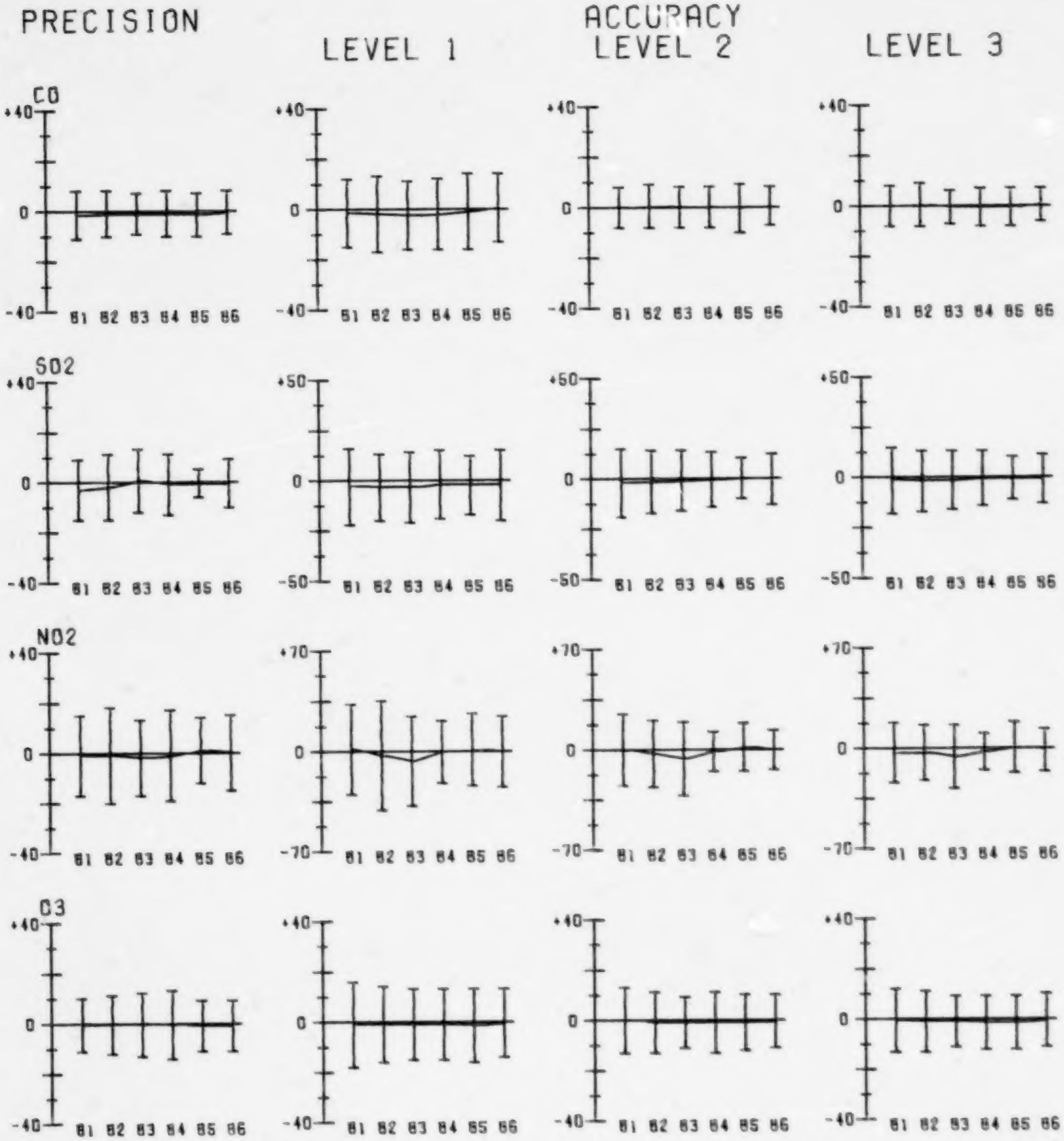
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 03



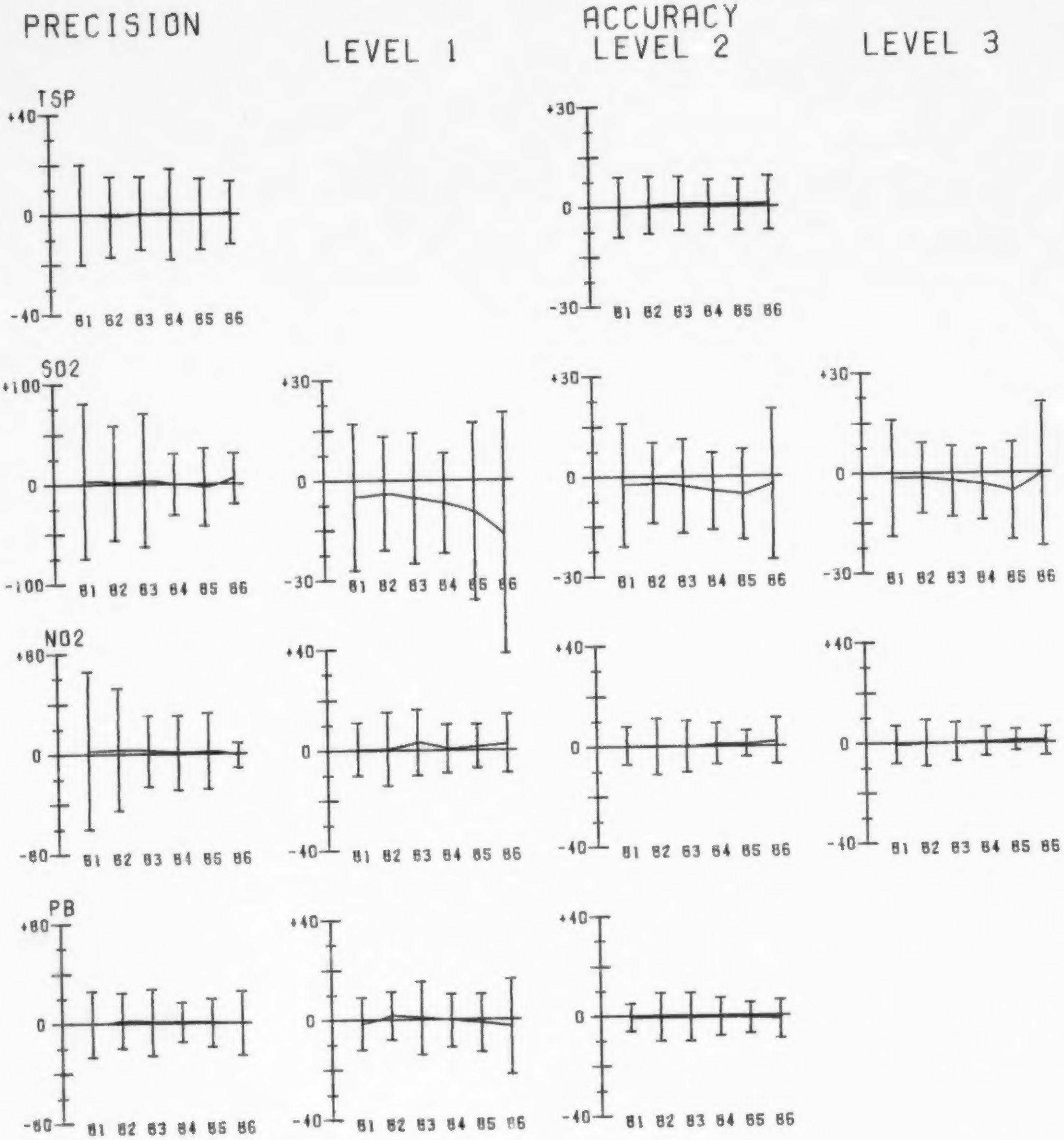
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 04



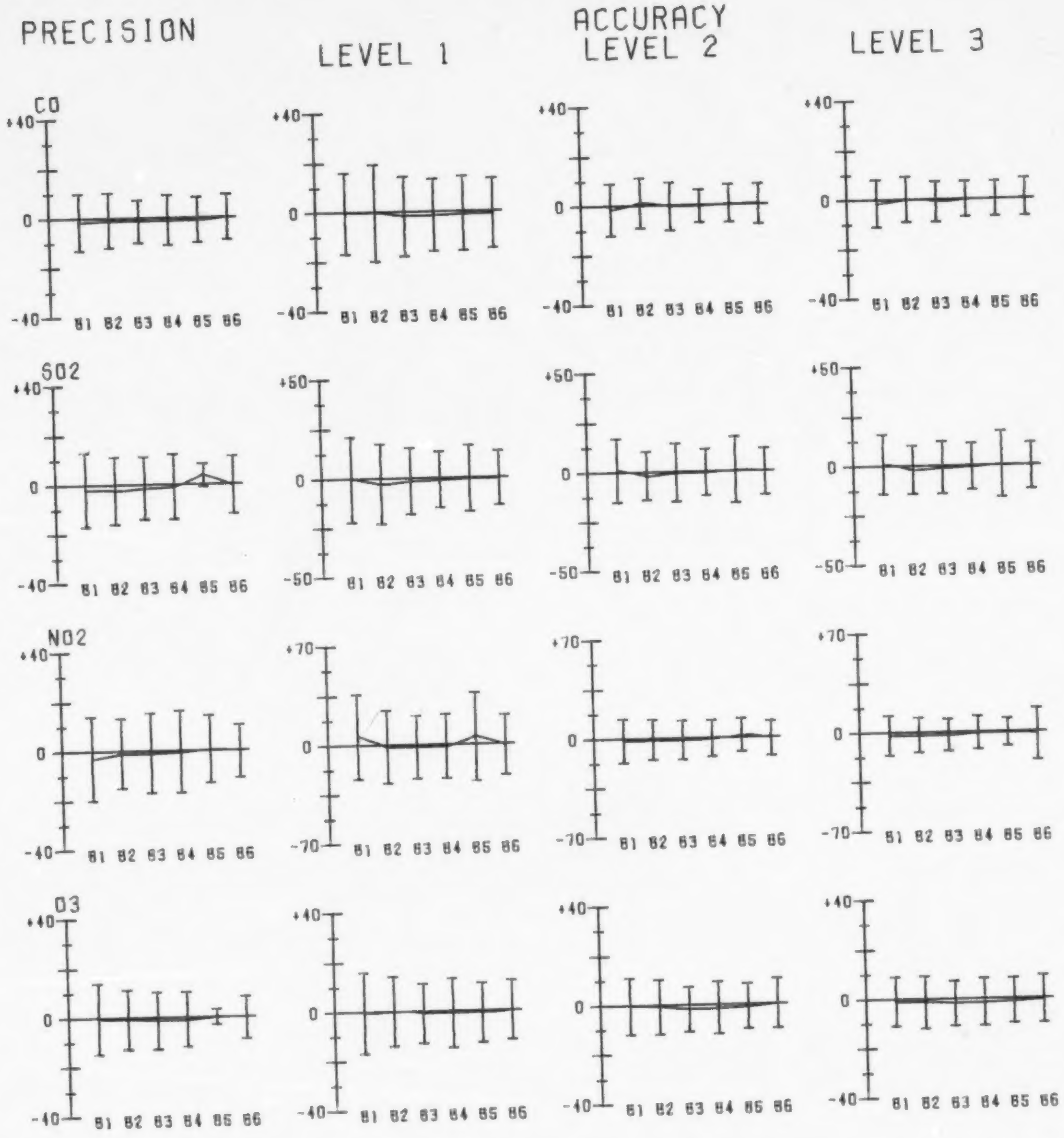
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 04



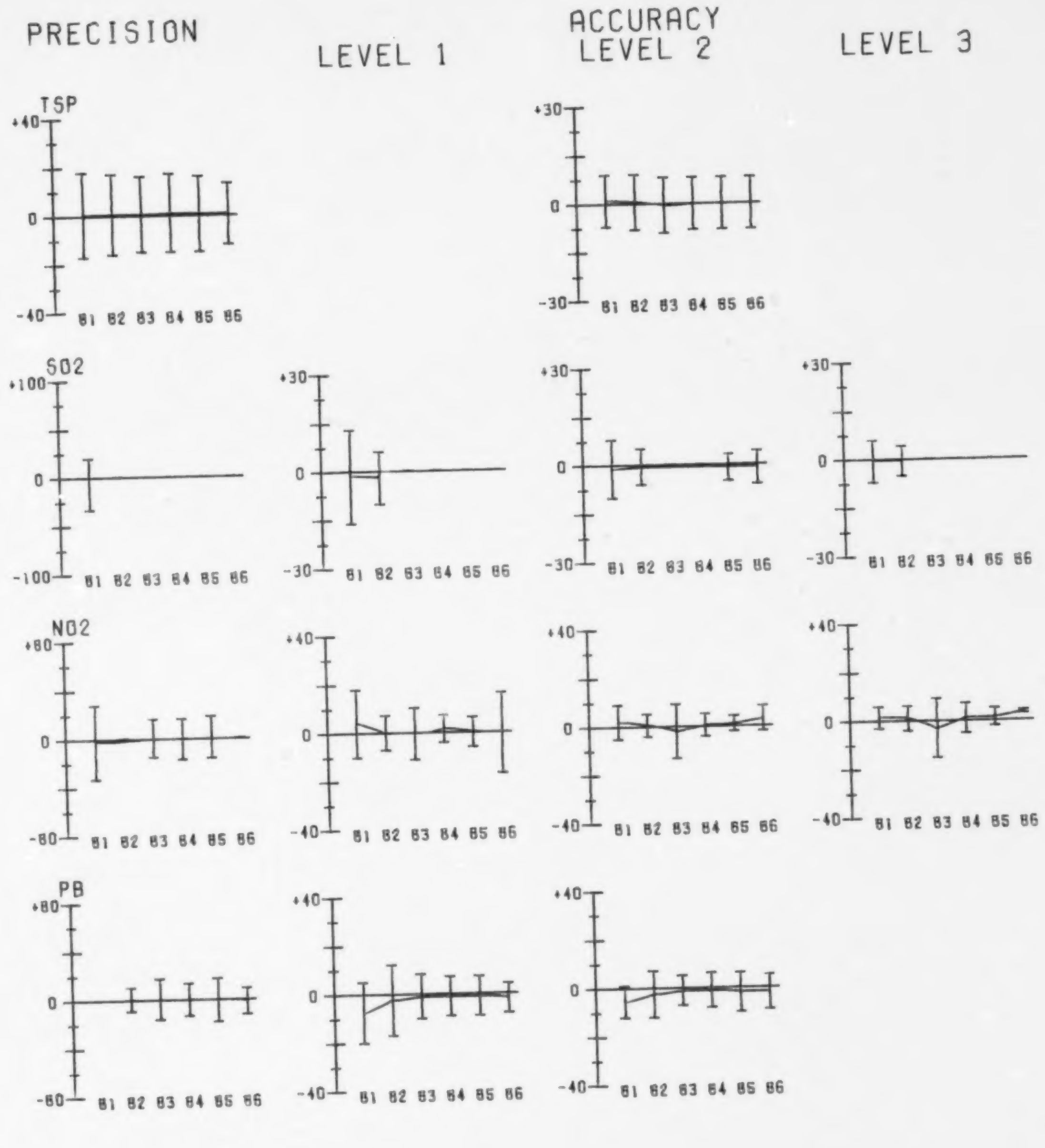
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 05



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 05



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 06

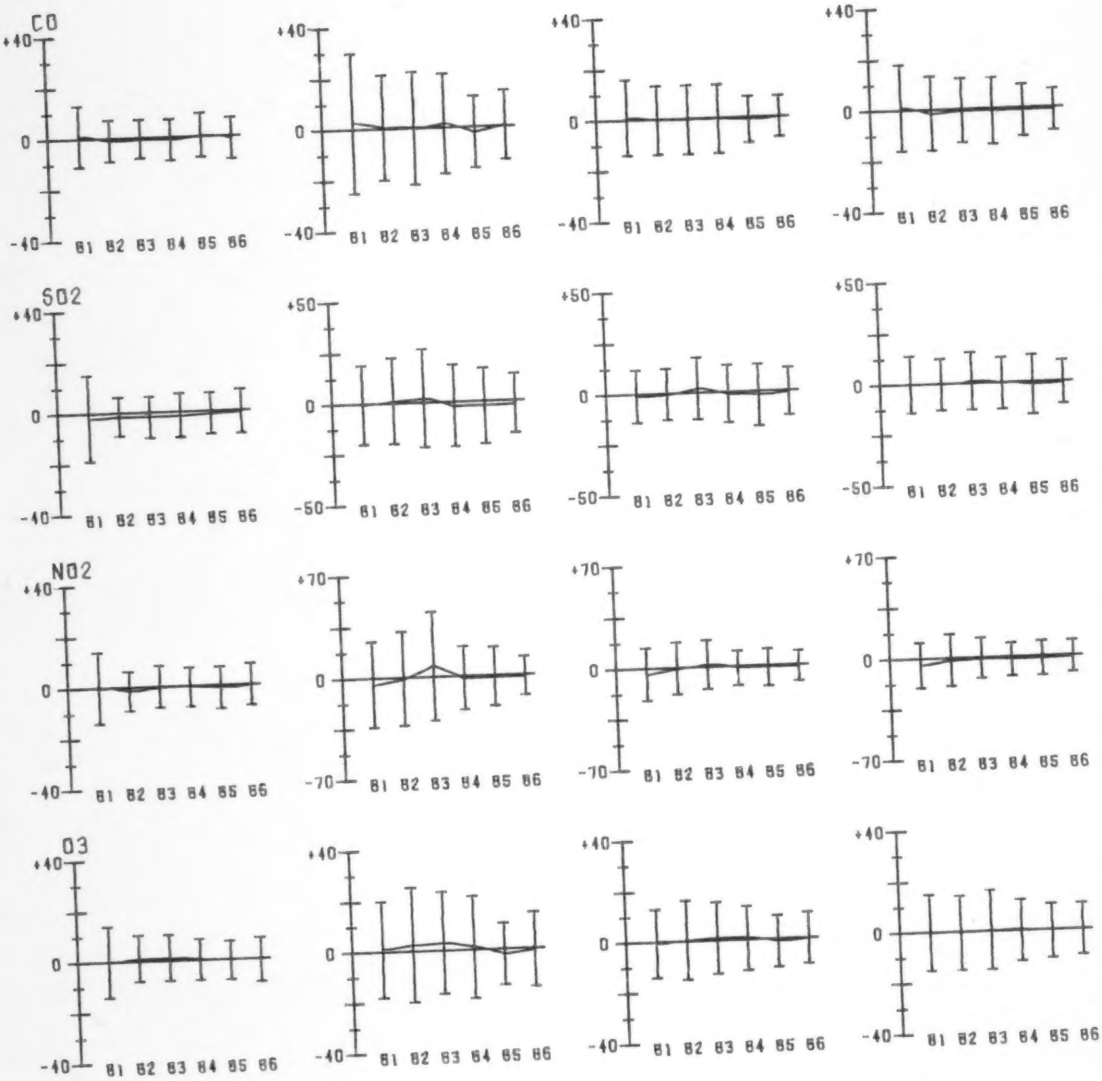
PRECISION

ACCURACY

LEVEL 1

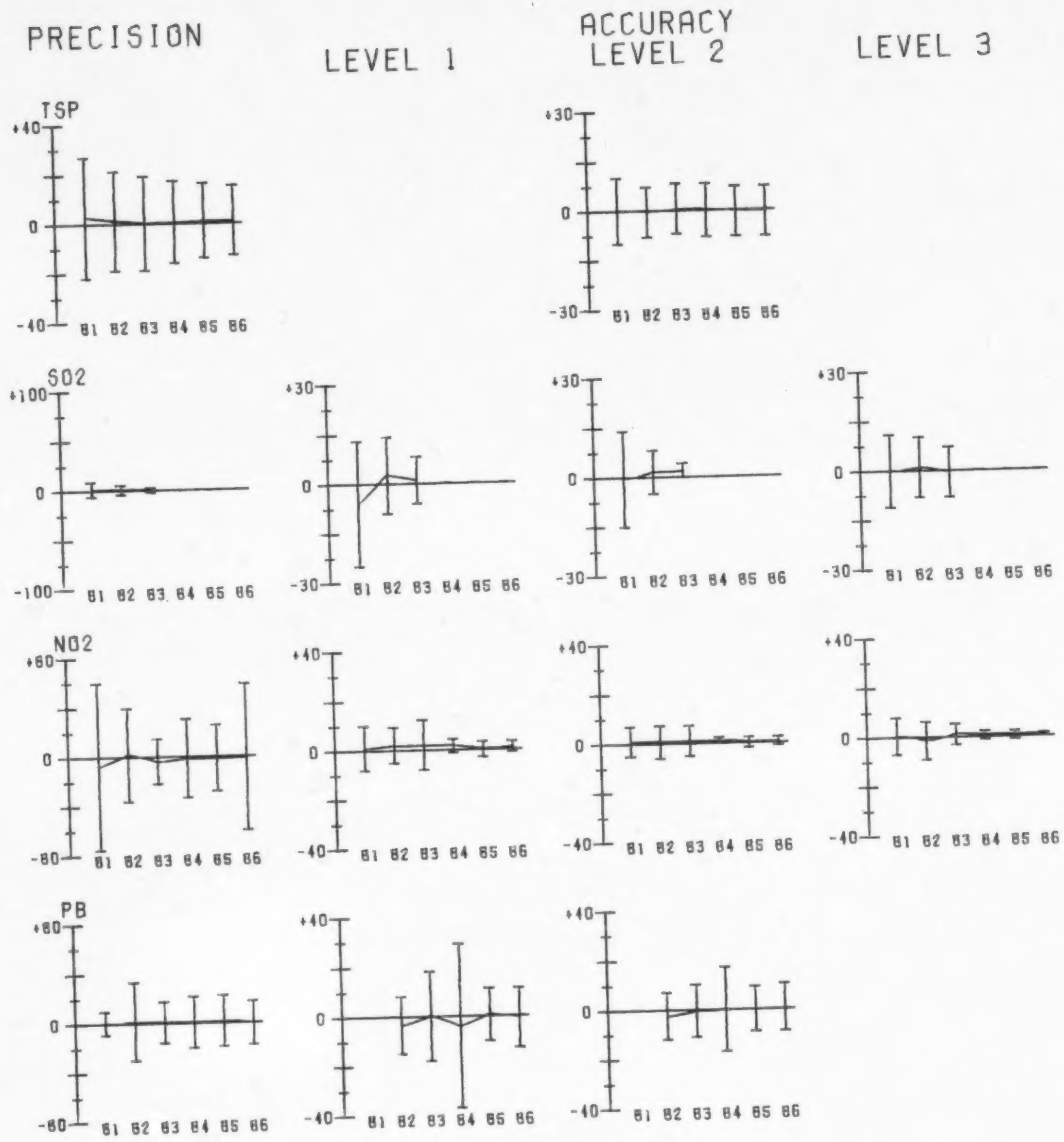
LEVEL 2

LEVEL 3



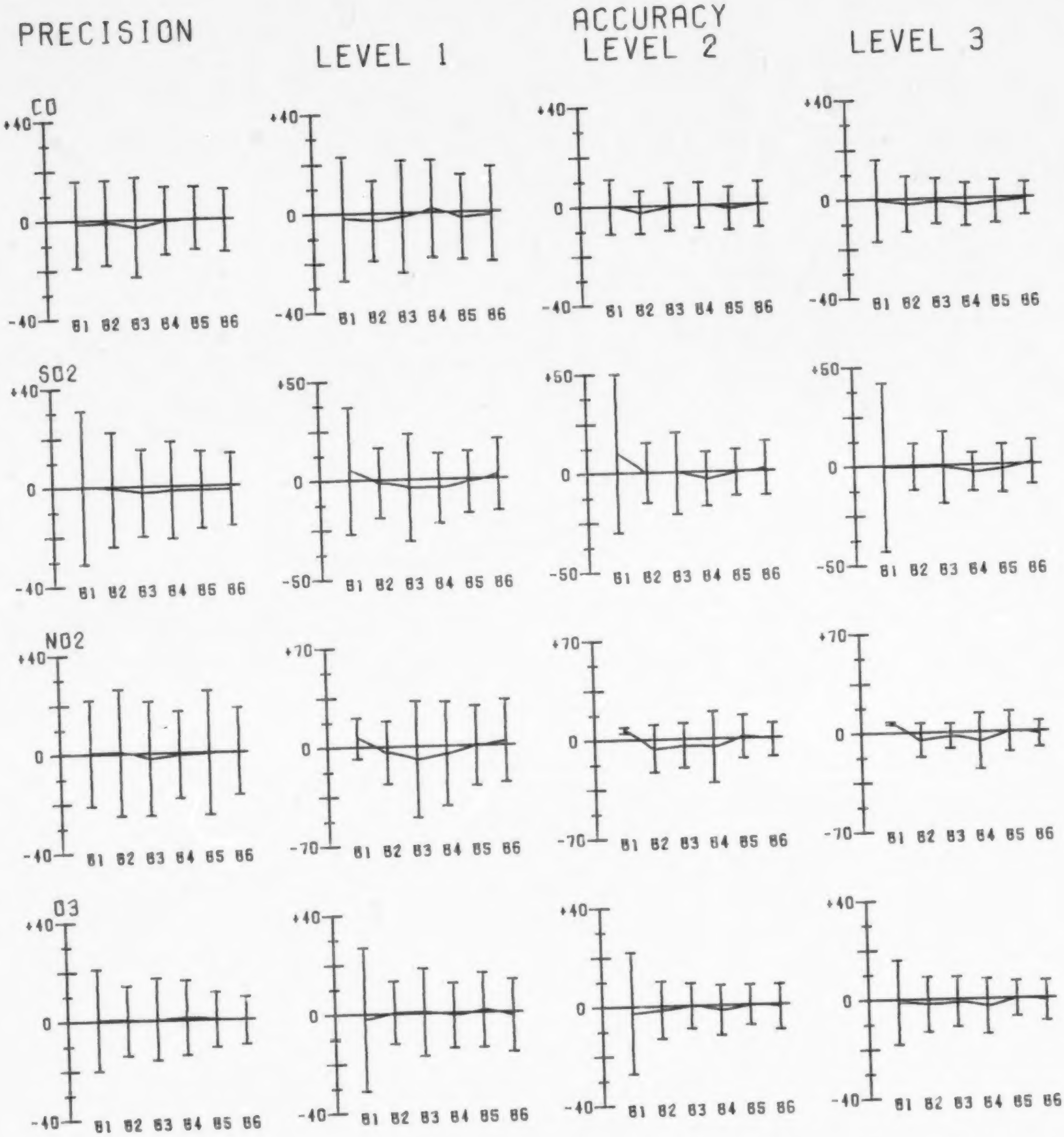
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 06



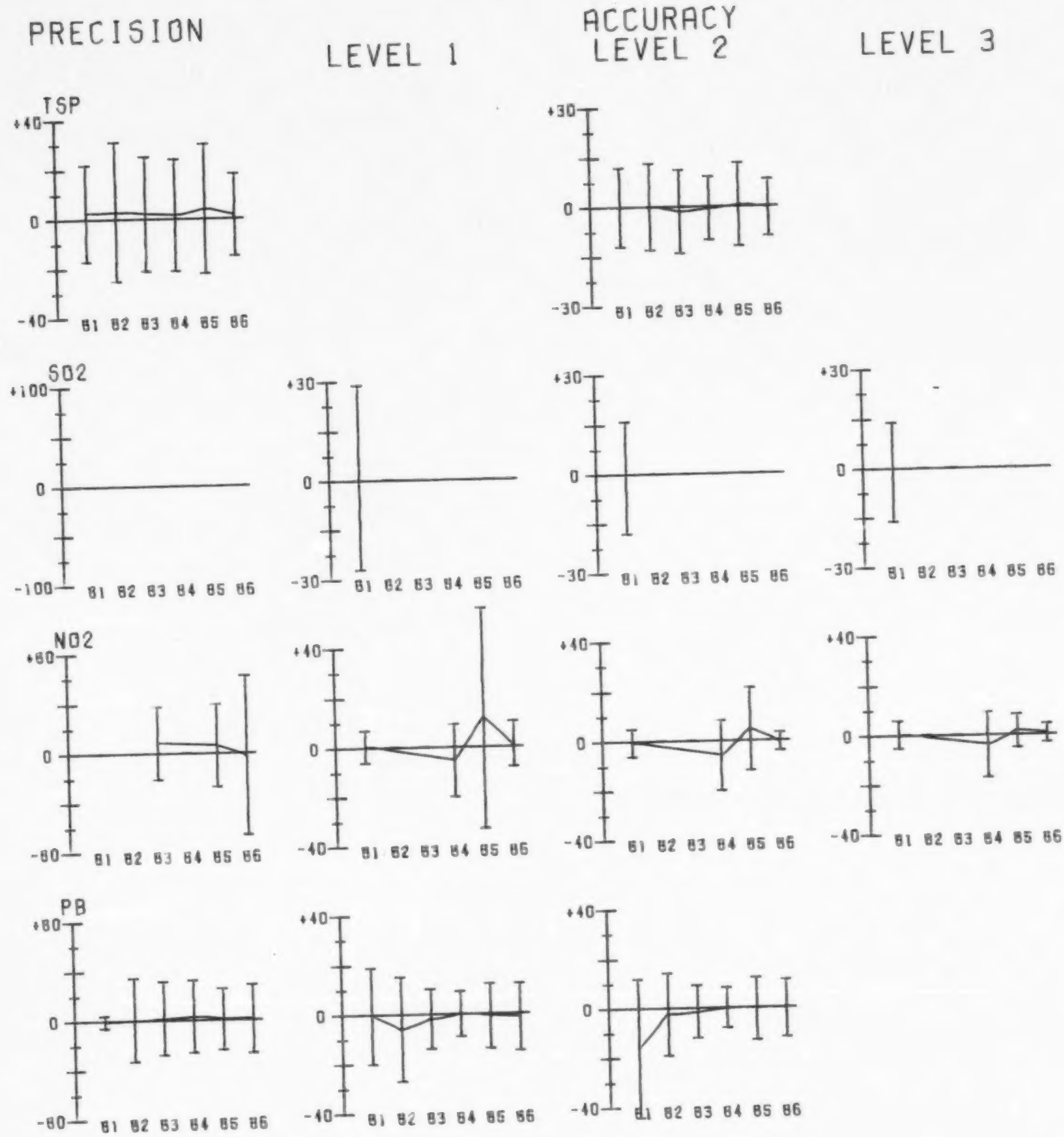
95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 07



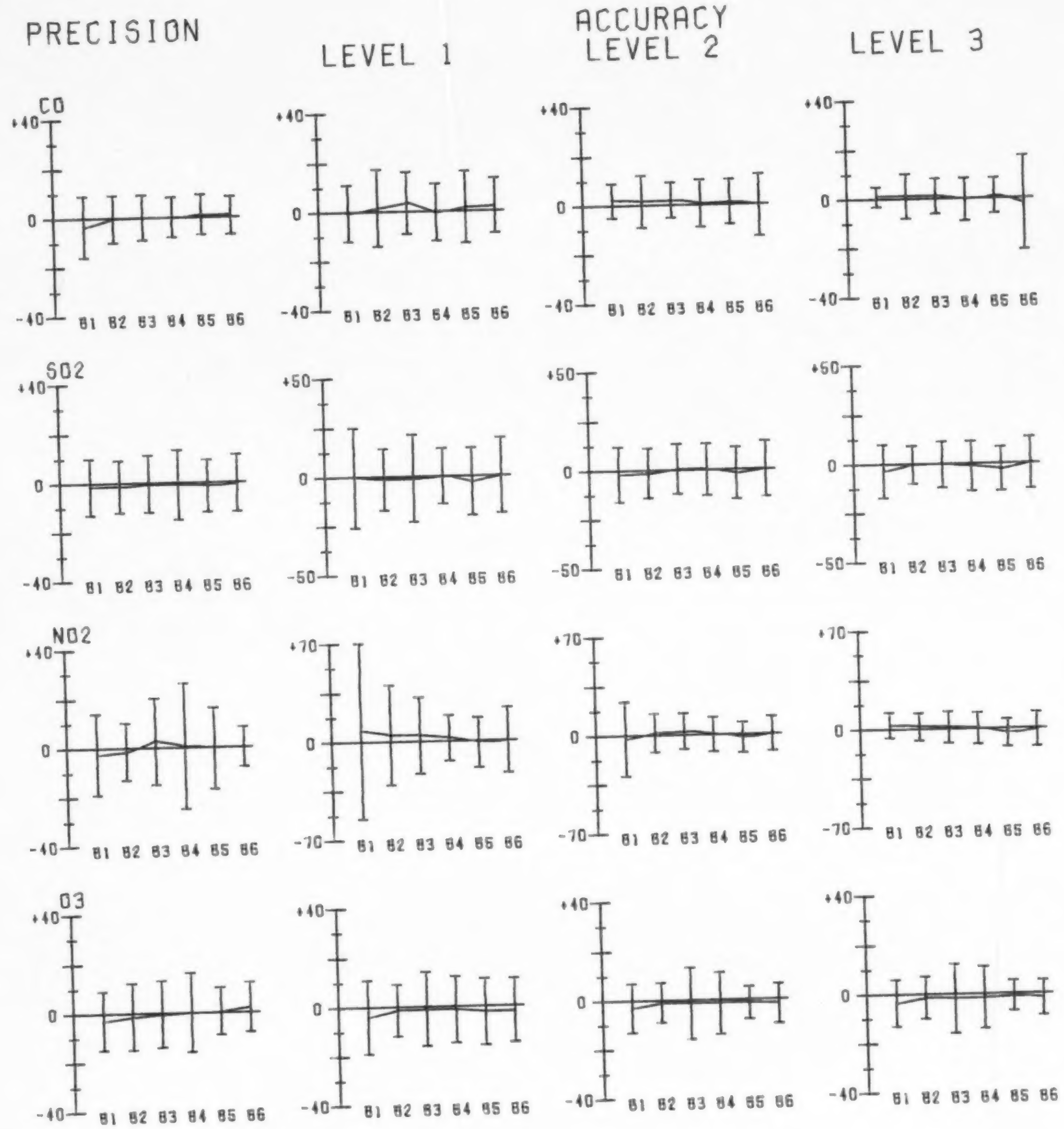
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 07



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 08


PRECISION

ACCURACY

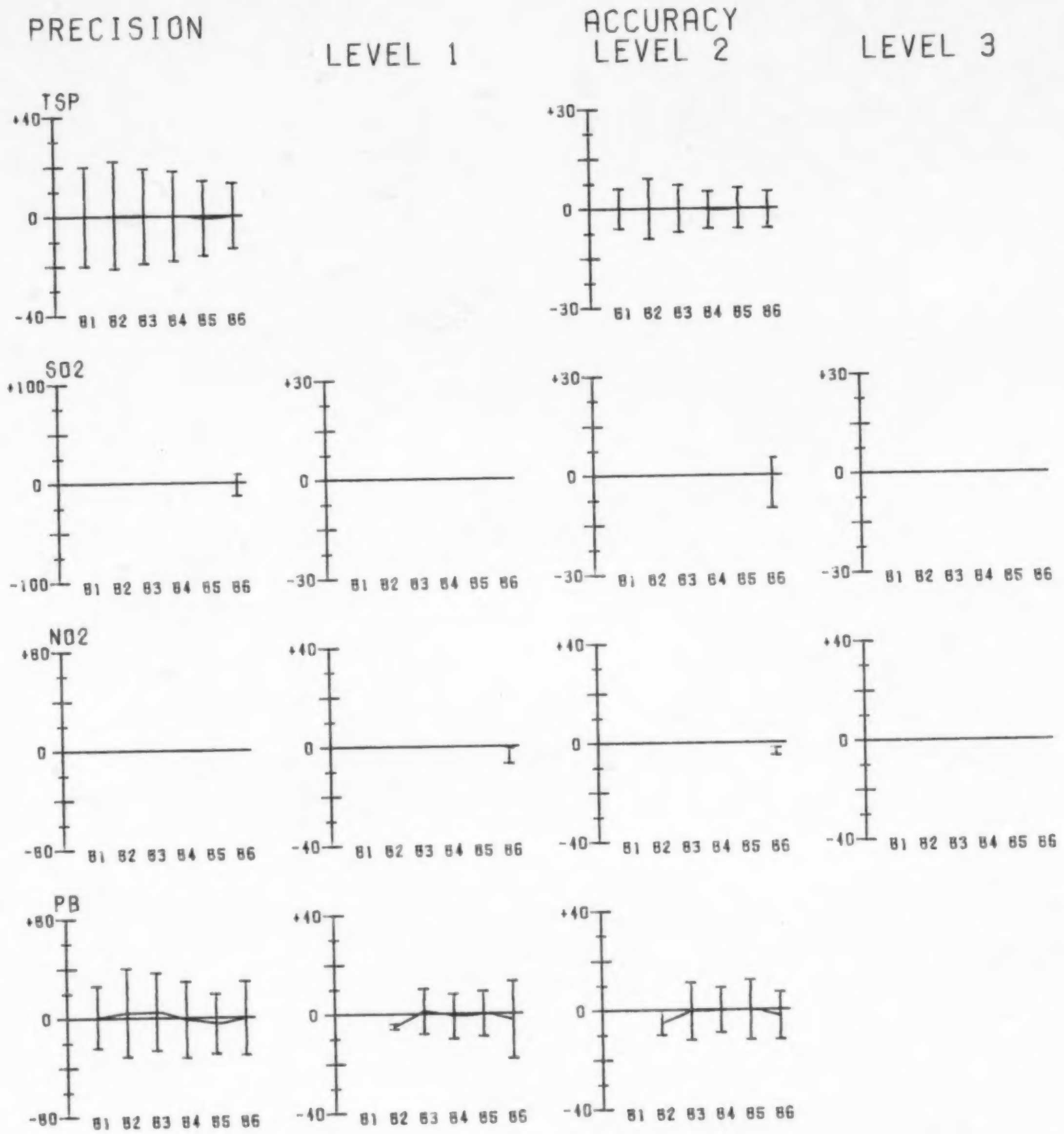
LEVEL 1

LEVEL 2

LEVEL 3

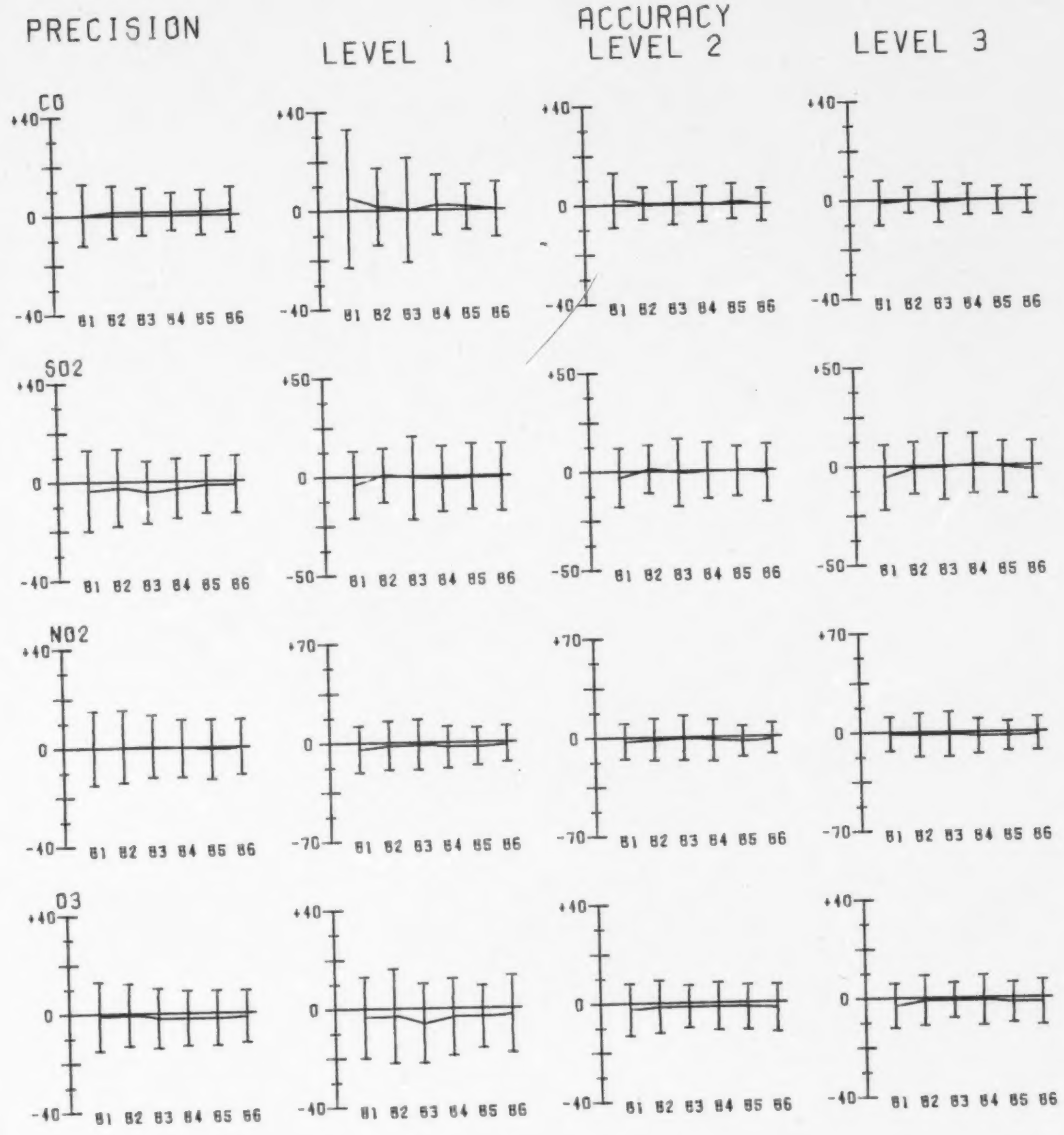
95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 08



95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 09



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 09

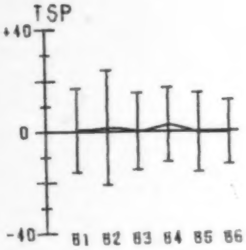
PRECISION

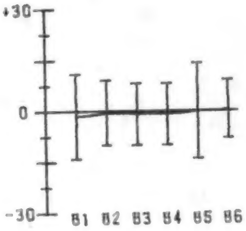
ACCURACY

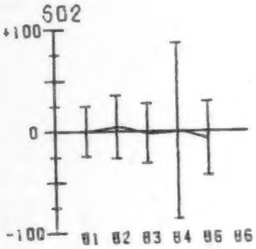
LEVEL 1

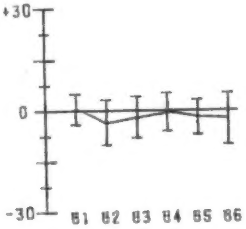
LEVEL 2

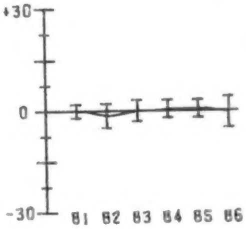
LEVEL 3

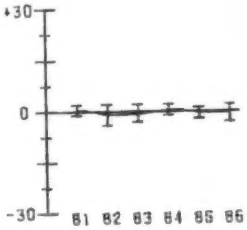


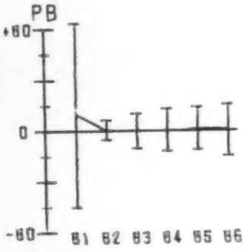


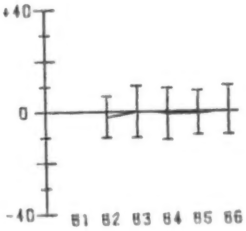


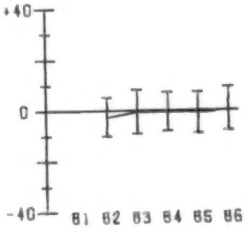






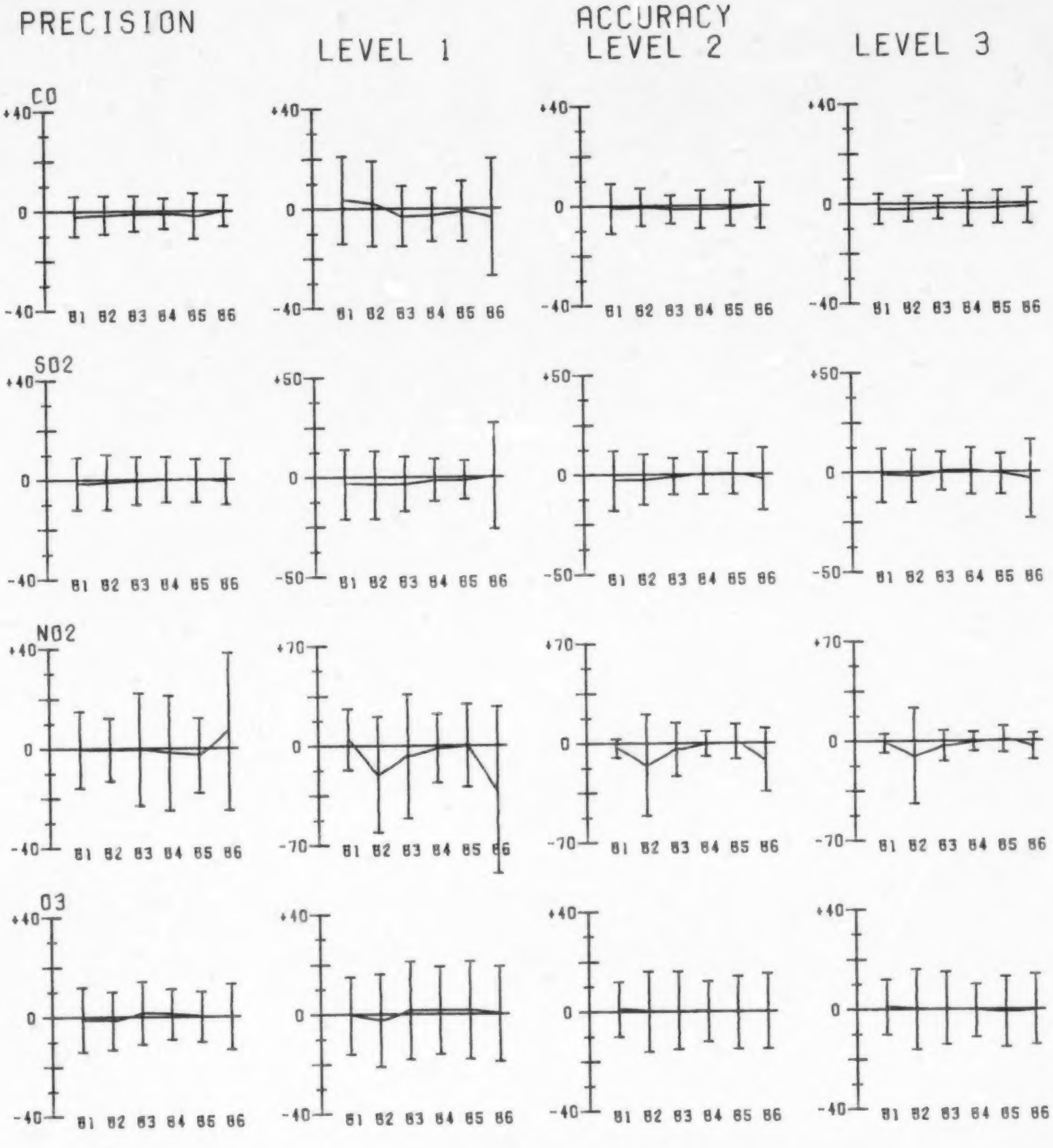






95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

REG : 10



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

REG : 10

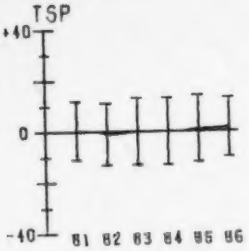
PRECISION

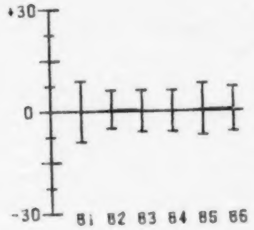
ACCURACY

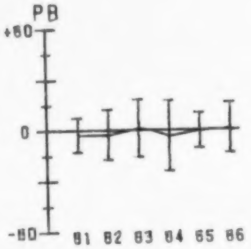
LEVEL 1

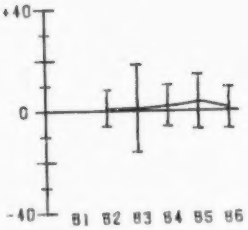
LEVEL 2

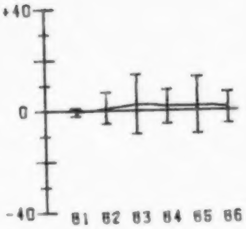
LEVEL 3









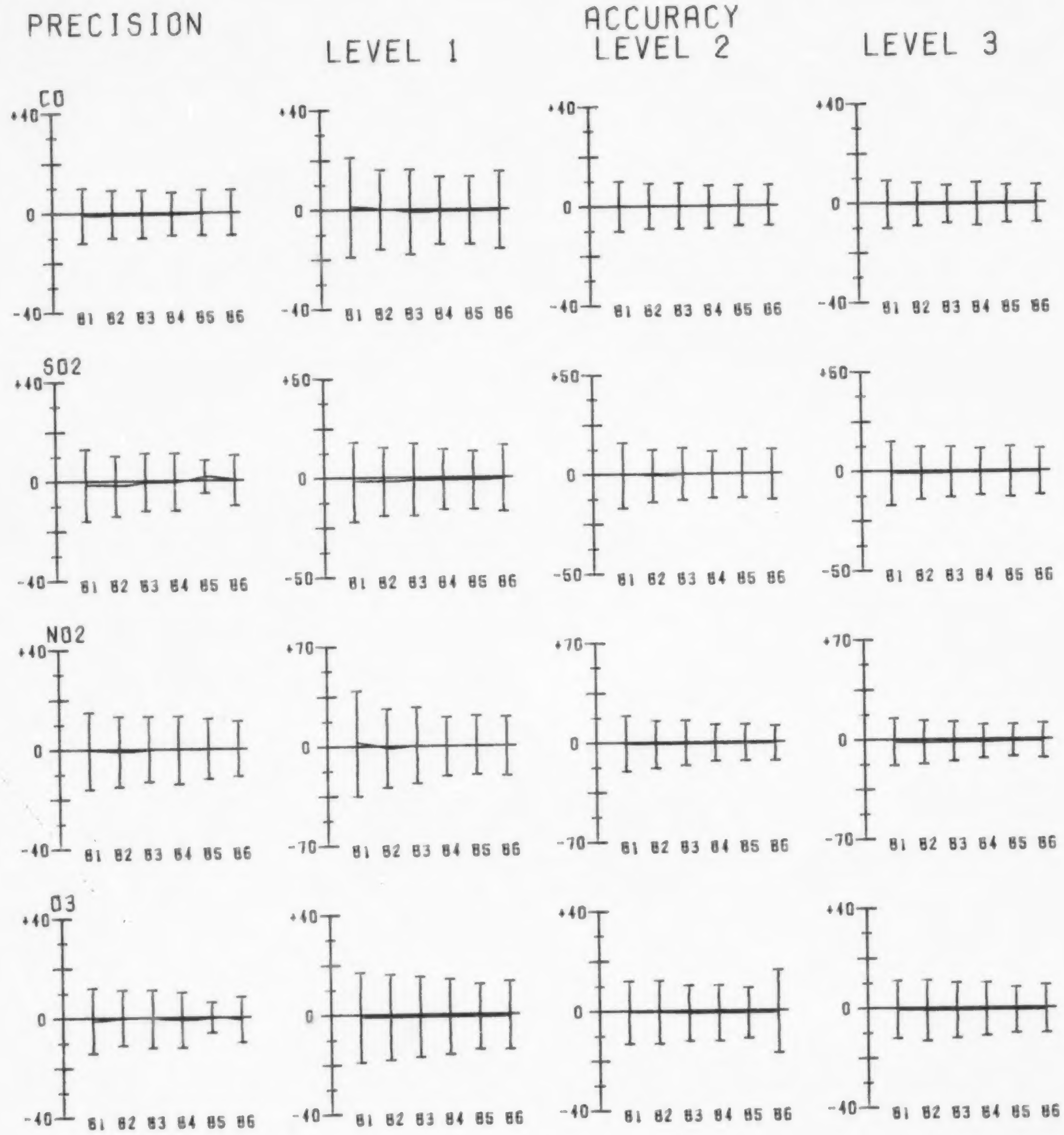


APPENDIX I

PRECISION AND ACCURACY GRAPHS FOR THE NATION

95% PROBABILITY LIMITS 81-86
CONTINUOUS METHODS

NATIONAL



95% PROBABILITY LIMITS 81-86
MANUAL METHODS

NATIONAL